a journal for precision engineers and all users of industrial diamonds and other hard materials

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MICROSTRUCTURES OF DIAMOND SURFACES

By S. Tolansky, D.Sc., F.R.S.

Read what the Reviewers say about this important book :—

This is a delightful book : firstly because it is a record of a piece of highly individual research by one school supervised and inspired by one man ; secondly, because it is superbly illustrated. Indeed, although the letterpress is easy to read, the ideas being clearly and simply expressed, it is probably the plates that will sell the book . . . Prof. Tolansky has developed new and very powerful optical techniques which actually reveal and enable him to measure surface steps or discontinuities of as little as 10 A., the effective useful magnification in such a case being X 500,000. . . . Cleavage, polishing, etching and sawing of diamond faces, octahedral, cubic, and dodecahedral, are all discussed in the light of really remarkable photographs, and some information is given on the difficult problem of " the two types of diamond."—Kathleen Lonsdale in " Science Progress."

Prof. Tolansky has been well served by the Goldsmiths' Press, whose wide experiences of diamond publishing has doubtless contributed to the success with which they have reproduced so many of his magnificent photographs of diamond surfaces. . . . Although all these methods are simple applications of well-known optical principles, it has remained for Prof. Tolansky to develop them into an extraordinary powerful array, needing skill to be sure, for their successful application, but comparatively little equipment beyond a good optical microscope to obtain one-dimensional resolution which compares favourably with that of the electron microscope. . . . The appearance of this book will be a welcome stimulant to many engaged in diamond research. It also provides valuable data for comparison with the artificial crystals of germanium and silicon, on which such an immense amount of effort is now being expended by the electrical industry. Since the stages of growth can actually be followed for these metals, comparative studies might well resolve some of the fascinating problems so literally brought to light by Prof. Tolansky's researches.—H. J. Grenville-Wells in " Laboratory Practice."

To those who use diamond as a tool, the information in the last two chapters, on " ring-crack " damage to diamonds, and on the surface condition of mechanically polished diamonds, should be specially worthy of study."—F. C. Franks.

Some of the traditionally accepted facts about diamond surfaces have been contradicted by Prof. Tolansky since he began studying the gem in his laboratory. His recent observations are described in " Microstructures of Diamond Surfaces." He reports, for instance, that tradition has it that diamonds have a perfect cleavage in particular directions. From optical studies of cleavage surfaces he says that " the cleavage is optically very far from perfect except in one type of diamond."—" Tooling and Production," Huebner Publications Inc.

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Some Characteristics of Diamond
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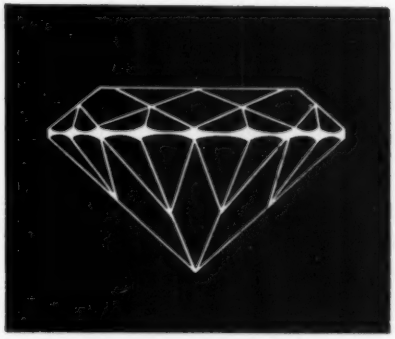

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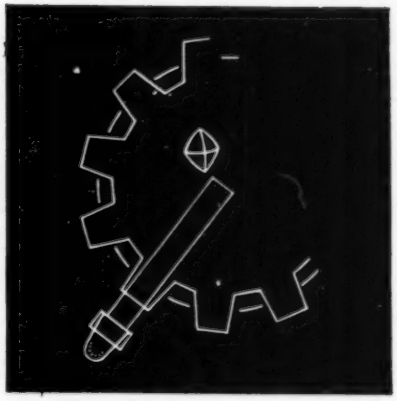

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Generally Speaking

Deeper Holes

An interesting follow-up to Dr Gaskell's article in last month's IDR* has been the announcement by the Diamond Research Laboratory of an improved type of diamond for use in drilling crowns. The stones are selected so that parts of the stone which might be the cause of breakage or undue wear in use, are absent and the stone as finally set in the bit consists only of the solid, unflawed core, shaped so as to be most resistant to damage and wear. Notable improvements in the footage drilled are claimed for crowns made of this material: in test drilling carried out at the laboratory, improvements of as much as 80% have been achieved. An interesting film of some of these comparative tests has been made by the Laboratory, clearly showing the greater life of the new-type bits.

Research Reports

Starting with this month's issue of IDR, we shall be publishing some of the results of experimental work undertaken at the Diamond Research Laboratory. The reports chosen will be on matters directly of interest to the user or maker of diamond tools, and as each of them will be a report of new and original work, their importance will be obvious. It is proposed to include these papers amongst the reprints obtainable from the Industrial Diamond Information Bureau.

Trade Fairs

The June issue of Industrial Diamond Review will carry reports of those parts of the exhibitions at the Hanover, Brussels and Liège trade fairs that are of interest to the readers of this journal. The Hanover Fair in particular has a large number of exhibits each year that are important from the point of view of the precision engineering industry, but each of the others has also its own specialities and will be fully covered in the reports.

ADAMANT

*IDR, March 1959, pp48-50

A Counting Device for Diamonds

by

Dr F. A. Raal

(Diamond Research Laboratory, Johannesburg)

Introduction

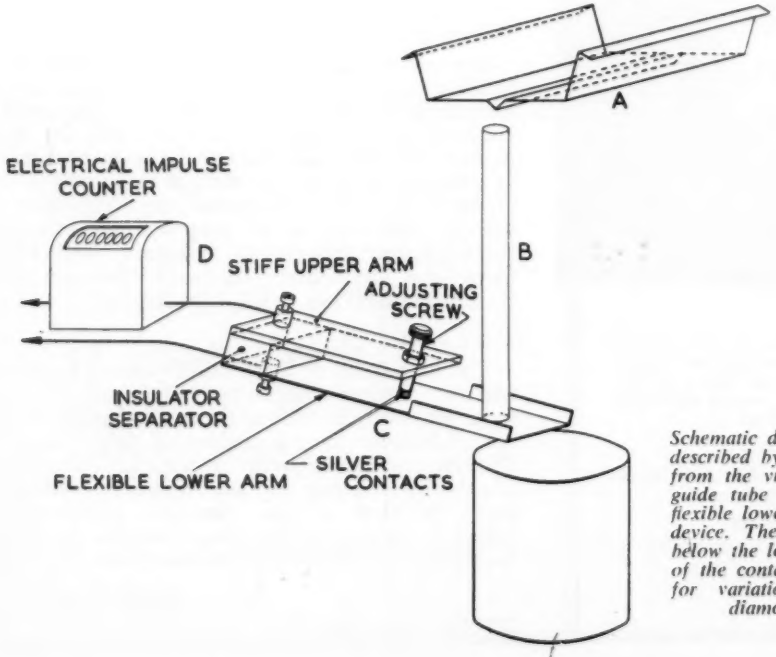
A simple and inexpensive counter has been designed to count electrically the diamonds used for drill crowns. These diamonds are in the diamond sieve size ranges —8+6, —6+5, —5+3, and —3+1 respectively. The counter is best described by reference to the accompanying illustration which gives a diagram of the various components.

Description of apparatus

A is a vibration feeder with variable rate control. The chute has been modified so that a V groove runs the length of the feeder, the purpose being to effect single file feed which is essential for the counter to operate successfully. About midway along the feeder is a hopper with a small gate in the base (not shown). The gate helps considerably in controlling the feed rate and ensures a single file feed. It is found best for the gate to be approximately $1\frac{1}{2}$ times the average diameter of the diamonds to be counted.

The glass guide tube B, of 5 mm diameter, is clamped vertically and immediately below the lip of the vibration feeder. The guide tube is important in that it ensures that all the diamonds impinge on the same part of the make and break arm. The energy acquired by the diamond in falling through the tube is dependent on the height of the tube and is given by $E = mgh$, where m is the mass of the diamond, g is the acceleration due to gravity, and h the tube length. With the larger diamonds, *ie* —8+6, a tube height of about 5 cm is sufficient. The height of the tube for smaller diamonds varies inversely with the mass of the diamonds.

C depicts the make and break contact. It was found more practical to make the triggering



Schematic diagram of the counting device described by Dr. Raal. Diamonds are fed from the vibration feeder A through the guide tube B and strike the end of the flexible lower arm of the break and make device. They then drop into the container below the lower arm. The adjusting screw of the contacts C can be altered to allow for variations in energy provided by diamonds of different sources.

mechanism work on the break and make principle, *ie* the current is flowing through counter *D* all the time, except when a diamond strikes the lower arm of the contact and breaks the circuit. This method did, to a large extent, minimize arcing over the contacts which was found to be troublesome when the diamond's impact was used to close the circuit. The counter's working was in no way impaired.

The make and break consists of a stiff upper arm cut from a brass plate. It has a $\frac{5}{16}$ in. screw thread tapped near one end with a terminal at the other. A brass screw with a silver contact on the end, and also a lock nut, fits into this hole to provide precise adjustment. The upper arm is rigidly attached to a separator made of any suitable insulating material. The lower arm is made of flexible phospor bronze and was cut from a blade used in diamond sawing. It is about $\frac{5}{8}$ in. wide, and $\frac{3}{4}$ in. from one end a hole is drilled and a silver contact press-fitted. Beyond the contact, the arm is cut $\frac{1}{4}$ in. wider, the extra width being bent up to provide a rigid striking section as shown in the illustration. Kept apart by the insulating separator, the lower arm is arranged and firmly clamped immediately below the upper arm so that only the two silver contacts touch.

The arm section as a whole is clamped at an inclination of about 30° to the horizontal, primarily to assist the incident diamonds in falling clear of the mechanism after impact. The tension in the lower arm is adjusted so that it has a sufficiently quick response to record successive diamonds. At the same time, the arm must not be so stiff as to miss the smaller stones in the aggregate. The arm is, in fact, adjusted to cope with the smallest stones in a particular size range. If the screening is good, this method of adjustment is most satisfactory.

The counting device proper is a commercial electric impulse type which can function equally well as a make and break or a break and make. The counter is designed for operation at 220 volts AC, but it was felt that if 50 volts DC could be used instead, arcing would be reduced considerably and performance improved. However, it was found that the counter did not behave as well as before and all subsequent tests were made at 220 volts AC.

In actual tests the counter consistently counted 500 diamonds without error.

Thin Wall Diamond Bits for Hard Materials*

by

W. H. Hampton**

Introduction

Thin wall diamond bits, which might be very roughly described as hole saws with a cutting edge of diamonds, are one of the most efficient precision tools yet developed for high speed production drilling, grinding, and finishing of the hardest materials. Glass, marble, ceramics, granite, fused cast refractory blocks, reinforced concrete, and zac block are a few of the hard materials which can be cored and finish ground by these bits at a rate comparable with that of other advanced production equipment. Developed by Hoffman Bros, these bits fill a need for highspeed drilling and finishing tools primarily for use on hard non-metallic materials. Successful tests for the use of these bits on hard metals have also been completed, though detailed data on this application for production are not yet available.

First used in glass industry

Extensive use of thin wall diamond bits first began in the glass industry when it was found

Fig 1. Oriented setting of whole diamonds into mould for Hoffman Surface Set Bit.

* Reprinted from *Grinding & Finishing* 1959 Vol 4 (9) pp 42-43 (Jan).

** President, Hoffman Bros Drilling Co.

Fig 2. Diamonds and matrix blends are bonded into tough, lasting bit heads in these sintering furnaces.

that glass and ceramic items having face widths as low as 0.015 in. could be processed economically and at high speeds. An instance of this is in the finish grinding of glass stoppered laboratory or medicinal bottles. At the point where such products are ground, the material is extremely thin yet considerable accuracy must be maintained to ensure a tight fit of the stopper. Prior to the use of thin wall bits, the production of these items on ordinary equipment was a slow process, and losses from breakage were high. On this and like jobs, the surprisingly low breakout of Hoffman bits eliminated excessive reject losses and cut production time to one-third or less of that required by previous methods.

These first diamond-impregnated thin wall bits developed for glass manufacturers were produced by carefully blending sieve diamonds with bonding agents such as cobalt and iron, cobalt and tungsten, or other similar bonding materials. In actual use it was determined that the diamond sieve size and the bonding agent had to be varied with the material to be penetrated.

Today these Hoffman diamond-impregnated bits are produced in varying blends of thirteen different bonding mixtures and nine different sieve or mesh size diamonds. The diamonds vary in size from 35 to 140 mesh, and the face width or the kerf of the bit from 0.015 to 0.125 in., depending on the material, the depth of cut, the speed of the drill, and the lubricant. These bits are currently in use for coring juicer bowls, auto glass, medicinal bottles, zac block liners, and ceramics, as well as being used on granite and marble statuary.

Tests are currently being conducted on the drilling of still harder materials for one of the leading tungsten carbide producers. To date $\frac{1}{2}$ in. OD impregnated bits are penetrating up to two-inch depths in carbide in a few minutes, with extremely favourable bit life.

Case history

The following case history illustrates the importance of individual research and bit design. A large eastern glass plant, using stock bits, was averaging 3,800 $\frac{1}{2}$ in. holes per bit, at a bit speed of 1,850 rev/min on a hand-fed operation, using water as lubricant. Samples of the material being cored were submitted to the Hoffman laboratory for thorough analysis. The tests resulted in a recommendation of a special bit with 0.032 in. face thickness and diamond depth of $\frac{3}{16}$ in., with water lubricant maintained at 40 lb pressure, and an increase in drill speed to 3,200 rev/minute. The average number of holes

Fig 3. Determining the correct bit for coring zac block. Similar tests are in progress for applications on bits on ferrous magnetite, tungsten carbide, and similar materials.

drilled per bit jumped to 16,000, breakage was reduced, and the recommended diamond-impregnated bit held OD gauge within 0.005 in. from its original manufacture. Additional tests demonstrated that changes from the manufacturer's recommendations in either drill speed or lubricant pressure resulted in shorter bit life.

Surface set bits

Diamond surface set bits make up the second large class of thin wall bits. These are most generally recommended for coring reinforced concrete, tile, sandstone, marble, granite, and like materials.

Surface set bits, which have a face width of approximately $\frac{1}{8}$ in., contain whole diamonds which are carefully oriented into moulds according to one of several pre-arranged patterns. With diamonds ranging in size from 40 to 150/ct, according to the final bit use, this is a job for skilled crystallographers. All diamonds used are carefully graded as to size and crystal structure.

The matrix holding the diamonds is normally composed of cobalt and iron or similar materials. On these bits, it needs only to hold the crystals firmly.

Research by Hoffman, enlarging on basic investigations carried on by the US Bureau of Mines, has indicated definite superiority of oriented over random set diamonds. Because diamond crystals are formed in layers or strata which vary in hardness, the longest bit life results when the diamonds are set so that the hardest diamond surfaces contact the work first. Strata analysis of each diamond crystal, along with setting it in proper relationship with the bit matrix, is known as orientation or oriented diamond setting.

Hoffman surface set diamond bits are resettable, enough new stones being added to bring the bit up to original specifications when it becomes dull. The practice of sharpening or dressing a surface set bit by using an abrasive wheel is not recommended. While the wheel breaks the diamond crystals and produces a sharp edge temporarily, it also destroys the crystal value. Only the manufacturer should attempt to restore the cutting ability of these bits.

In the interest of economy and increased drilling versatility, Hoffman has introduced three grades of surface set thin wall bits. Superior Brand bits contain only top quality octahedral and dodecahedral diamonds. The value of this grade lies not only in the fast cutting action, but also in the number of times the bit can be reset. General Brand bits contain medium quality diamonds, at a lower price. Utility Brand bits, with small diamonds, are economical throwaway units. This type is highly successful where the material to drilled contaminates the bit.

Combination narrow kerf bits

A third type of thin wall diamond bit, just recently produced by Hoffman for industrial users, is the combination narrow kerf bit, combining some of the best qualities of both surface set bits and diamond-impregnated bits. This type is recommended for drilling certain glazed or surface hardened materials where a break-in period is required for using an impregnated bit. With the combination bit, the surface set crystals take hold immediately and are set to actually break up during the drilling. This, in turn, exposes the impregnated diamonds to add increased sharp cutting life to the bit. The manufacture of these bits requires extremely careful control to assure exact timing of the diamond release.

Thin wall bits are used with water as the lubricant, or dry, according to the application. Oils are never used, as they tend to gum up the bits. Where water is used it is important that pressure be maintained at the recommended level.

Hoffman thin wall diamond bits are precision tools whose application requires careful balancing of such factors as the material to be ground, the equipment available, the lubricant, and the pressure at which it should be applied, the composition of the matrix, the rev/min of the bit, as well as its recommended face width and diamond depth. Standard core bit sizes range from $\frac{1}{2}$ in. up to 12 in. OD, and non-coring bits are available as standards in sizes from $\frac{1}{8}$ in. to 15/16 in. OD. The use of additional core barrels makes possible the drilling of holes up to 24 in. in depth, though depths over 18 in. are rarely required. Providing such recommendations, including all the necessary tests, is an additional free service of Hoffman Bros.

New London Showroom

A. A. Jones & Shipman Ltd. announce the opening of a new London Office and showroom at 50-52 Great Peter Street, S.W.1.

Adamas Carbide Appoint New Rep

Mr Eric Werner, of Tool Specialists Inc, has been appointed Southern New Jersey representative for Adams Carbide Corp products.

R. Van Alstine Tool Co is New Adamas Rep

Adamas Carbide Corp, of Kenilworth, NJ, has announced the appointment of R. Van Alstine Tool Co Inc, 205 Central Ave, Schenectady, New York, as an authorized Adamas representative. Adamas Carbide Corp manufactures a complete line of tungsten carbide tools, tool tips, dies, wear parts, and Dex-A-Tool, the Adamas toolholder for throwaway inserts.

Diamond Honing Diesel Engine Rocker Arms

Summary

The fine tolerances required on the bores of diesel engine rocker arms are achieved by a fine boring operation on a Precimax fine borer, followed by a Microhoning operation on a Model 721 Hydrohoner. The two smaller bores are honed from 1.497/1.499 in. to 1.5000 + 0.0014 — 0.0000 in., and the larger bore is honed from 2.372/2.374 in. to 2.375 + 0.001 — 0.000 inches. Silicon carbide hones required changing after honing approximately 70 larger bores or 100 smaller bores; the Diamold diamond hones have now completed about 6,600 larger bores and 9,000 smaller bores. They will not require changing for some time.

Introduction

The Rootes 3-cylinder direct injection water-cooled horizontal diesel engine produced by Tilling-Stevens Ltd, Maidstone, is a commercial engine for use principally in Commer trucks and coaches. With the exception of the production of the castings, all operations are carried out at the Maidstone works. The rocker arms for the engine (Fig 1) are of EN16T drop forged steel,

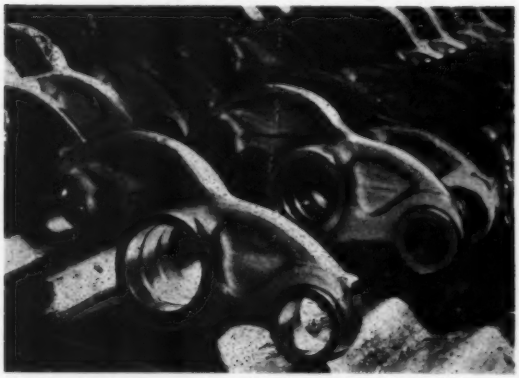


Fig 1. Rocker arms for the 3-cylinder direct injection water-cooled horizontal diesel engine.

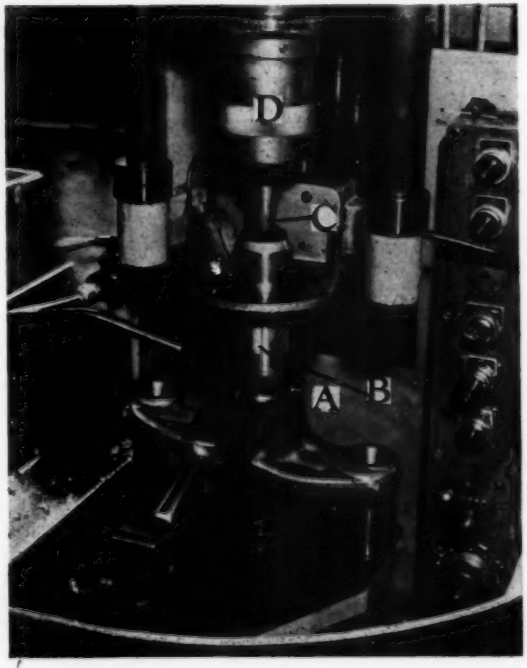
which has a diamond pyramid hardness in the region of 260 to 300. The three bores in the arm have to be machined with a high degree of accuracy, and this is achieved by following the initial Precimax fine boring operation by Microhoning on a Hydrohoner 721.

The Hydrohoner 721

Though the model 721 Hydrohoner has now been superseded, it works on exactly the same principle as the later models. Fig 2 shows details of one of the Hydrohoners used by Tilling-Stevens. The hones A can be made to project the required distance from the honing block B by a cone-shaped bar C which is advanced into the honing block by means of steplessly variable control D. The set-up shown in Fig 2 is for the larger central bore; it uses six diamond hones. The clamping device shown is no longer used in the operation.

After the Precimax fine boring operation, the diameter on the central bore is 2.372 to 2.374 in.; this is honed to 2.375 + 0.001 — 0.000 in., requiring a stock removal between 0.001 and 0.004 inch. The fine boring operation produces a smaller bore diameter of 1.497 to 1.499 in., which is honed to 1.5000 + 0.0014 — 0.0000 in., giving

Fig 2. Close-up of the Hydrohoner 721 showing the rocker arm in position. The clamping device shown here is no longer used.



a stock removal, in this case, of 0.001 to 0.0044 inch. The approximate time taken for the diamond honing is 1.45 min for the central bore and 2.45 min for the two end bores.

The diamond hones

The Hydrohoner 721 was originally equipped with silicon carbide honing stones which had a life of approximately 70 bores on the larger diameter, where six stones are used, and a life of approximately 100 bores on the smaller diameter, using four stones. The change to diamond hones was made in the middle of 1958, and the original hones are still in use. The diamond hones on the smaller bores have now completed some 9,000 bores, and those used on the larger bores have honed approximately 6,600. Manufacturers of the bronze-bonded diamond hones—Diamold hones—are Diagrit Diamond Tool Co Ltd, who recommend a touch with a silicon carbide stick for the dressing operation. Two sizes of hone are used for the rocker arm operation: the six used on the central bore are each $1\frac{3}{4} \times 5/16$ in., and the four used on the end bores are $1\frac{1}{4} \times 5/16$ inches. The specified finish for the bores is 35 micro-in., and the diamond hones give a consistent finish of 32 to 36 microinches.

The lubricant

The lubricant chosen for the operation is Swift H, a chlorine-activated oil produced by Fletcher Miller Ltd, of Hyde, Cheshire. The oil is free-flowing, and, because of the chlorine additive, it has marked anti-weld properties. The Swift H is used in 60/40 solution with paraffin.

Conclusion

The success of this application of diamond hones with Hydrohoner machines is evident from the fact that A. A. Jones & Shipman Ltd, manufacturers and importers of Micromatic honing machines, have recently concluded an agreement with Diagrit Diamond Tools Ltd, manufacturers of the Diamold diamond hones, as a result of which Jones & Shipman have become the sole selling agents throughout the world for Diamold hones.

Fig 3. Two Hydrohoner 721 honing machines in the workshop of Tilling-Stevens Ltd, Maidstone.

A New Optical Screw Cutting Tool Setting and Profile Gauge

The forming of threads by means of the simple cutting tool is today still a common process especially when it is a question of threads on machine parts which are manufactured in small batches or as single items. The accuracy of a thread produced in this way is, together with the tool and the machine itself, dependent on the perfect setting of the cutting tool in the lathe. For screw cutting it is of the utmost importance that the cutting edge of the tool be exactly the same height as the work centre. In addition the flanks of the tool must be square with the work. A faulty adjustment of the cutting tool will cause distortion of the thread profile. The correct setting of the tool height is relatively easy and can be performed without additional accessories. The squaring of the tool to the work on the other hand is not so simple and a screw cutting gauge is commonly used for this purpose. In setting the cutting tool, the gauge profile is placed directly against the cutting edge of the tool and the gauge then adjusted so that the straight edge lies either on the surface of the workpiece or leaves a narrow gap. The success of the setting process depends to a large extent on the skill of the operator since the gauge can be easily misaligned, resulting in wrong adjustment of the cutting tool. For more accurate setting of the cutting tool, a profile microscope

Continued on p. 74

A New Method of Determining the Average Shape of Diamond and Other Particles

by

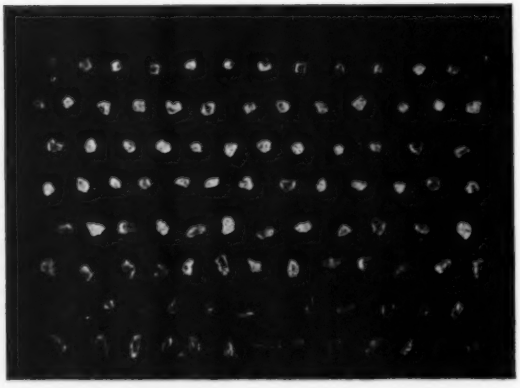
Dr J. F. H. Custers *and* **Dr F. A. Raal**

(Diamond Research Laboratory, Johannesburg)

Summary of earlier method

The performance of diamond particles in grinding wheels and other abrasive forms depends to a considerable extent on their shapes. It is important, therefore, to be able to give an accurate assessment of the average shape of the particles. Up to the present, the average shape or ' Shape Count ' of the particles has been arrived at in the following way. A representative sample of the diamond grit is spread out on a glass slide and inspected, with suitable magnification, under a stereoscopic microscope. One hundred particles are studied individually for shape, and a value of either 1, 2, 3, or 4, depending on the three-dimensional form of the particle, is assigned to each. The Shape Count is then evaluated by getting the arithmetic mean for the 100 particles. Thus a Shape Count of 1 would indicate cubes or blocky particles, and a Shape Count of 4 would point to practically all particles being needle-like and/or flat. Intermediate Shape Counts represent mixtures of various shapes. A sample with a Count of 2 would contain mainly blocky particles, whereas a Count of 3 would point to more needles and/or flats than blocks. Fig 1 shows a reproduction of diamond particles of various Shape Counts. It is obvious that, with this method, the evaluation of the shape of the individual particles is subject to personal interpretation and is open to large discrepancies. In order to eliminate this a new objective method of average shape determination has been developed which has proved to be considerably more accurate.

Fig 1. The top two rows represent diamond particles of Shape Count 1; The next two rows of particles have a Shape Count of 2, followed by two rows of Shape Count 3. The bottom two rows of particles have a Shape Count of 4.



Description of new method

Assume V to be the average particle volume of a sample of grit, and let S be the mean particle size. As a rule, particle size in microscopic examination is taken to mean the diameter of a circle having the same area as the projected image or profile of the particle when viewed in the direction perpendicular to the plane of greatest stability. This dimension is called the projected diameter D_p, and its arithmetic mean for a number of particles is the average projected diameter D. The ratio V/D^3 is known as the Volume Shape Factor, and is found empirically to remain sensibly the same for various size grades of one and the same material with the same Shape Count[1].

As it is more convenient, in the case of diamond grit, to work with the reciprocal value of the Volume Shape Factor, we shall take D^3/V as the new criterion of average shape and call it simply Shape Factor (SF). Thus, as can be seen in Fig 2, cubes of edge x units, where x is variable, have a Shape Factor of 1.44. The edge length of a cube being x, its projected area is x^2. A circle with diameter D_p has the same area as the projected cube if:

$$\frac{\pi}{4} \cdot D_p^2 = x^2, \text{ from which } D_p = \sqrt{\frac{4x^2}{\pi}} = \frac{2x}{\sqrt{\pi}}$$

As the volume V of this cube is x^3, we thus find for the Shape Factor SF:—

$$SF = \frac{D_p^3}{V} = \left(\frac{2x}{\sqrt{\pi}}\right)^3 : x^3 = \frac{8}{(\sqrt{\pi})^3} = 1.44$$

It is evident that $D_p = D$ in the case when all particles are perfect cubes. If the particle is a sphere with diameter D, its SF is:—

$$SF = \frac{D^3}{V} = \frac{D^3}{\frac{\pi}{6}D^3} = \frac{6}{\pi} = 1.91$$

Fig 2. Models of three regular shapes with their corresponding Shape Factors.

The same procedure is followed for particles of other shapes. Rectangular blocks of dimensions $\frac{x}{2}$, x, and $2x$ units have a Shape Factor of 4.06, whereas flat plates of sides $\frac{x}{4}$, $2x$, and $2x$ units will show a Shape Factor of 11.50. Intermediate shapes will have values ranging somewhere between 1.44 and 11.50.

In a sample of diamond grit, the average volume per particle can easily be evaluated by weighing a known number of particles accurately on a micro-balance and assuming that all the particles have a density of 3.52 which is normal for diamond. The average projected diameter per particle for the sample can be obtained by comparing the projected area of the particles on a projection microscope with calibrated circular graticules, and taking the arithmetic mean. This method is rather time-consuming and a photo-electric one was resorted to which has proved most satisfactory. An ordinary microscope slide is taken, and a metal washer, having a uniform internal diameter of 6.4 mm, is fixed to it with cement so as to give a circular cup. This is then viewed with suitable magnification on the screen of a projection microscope, and the illuminating source and condenser lenses positioned so that a uniformly illuminated circular area is seen. The microscope is so arranged that the image on the screen can, in turn, be projected on to a photo-electric cell by interposing a 45° mirror. Let I_o be the light flux incident on the photo-electric cell through the washer with nothing in the cup. If, now, diamond particles are put in the receptacle, their images will obscure part of the light so that the light flux measured by the photo-electric meter is I instead of I_o. Since I/I_o is a measure of the obliteration of the circular patch of light by the diamond particles, the area covered by them can be calculated quite readily knowing I, I_o, and the area of the hole in the washer. By knowing the number of particles, the mean projected diameter D can then be found.

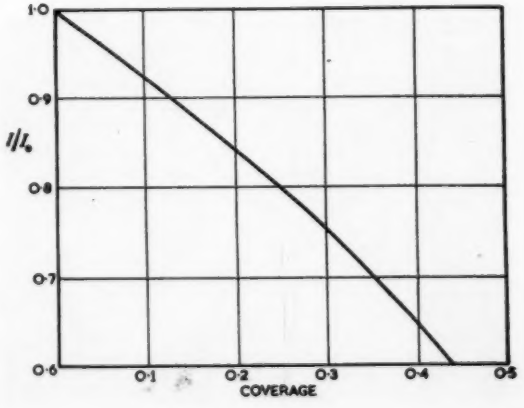
The photo-electric cell can be calibrated in the following way. A number of small buckshot is selected for uniformity of shape and diameter. I_o is measured and the buckshot put, one by one, into the circular cup, the resultant light flux being measured after each addition so as to give readings I_1, I_2, I_3, et cetera.

Knowing the diameter of the washer and the diameter of each buckshot, the coverage can be plotted as a function of I/I_o, as shown in Fig 3. This standard curve is then used to determine the coverage by diamond particles by simply reading off I and I_o.

The whole procedure for determining the Shape Factor of diamond particles is, therefore, as follows:

Firstly, I_o, is recorded with no diamond in the cup. Some 150 particles, depending on size, are then shaken into the cup and the latter tapped

Fig 3. Coverage plotted as a function of I/I_o.



to distribute them evenly, following which I is measured. The coverage is read off from the graph in Fig 3, and, by counting the number of particles N, the mean projected diameter D in mm is known, since

$$\text{Coverage} = N \times \frac{\pi D^2}{4} \Big/ \frac{\pi(6.4 \text{ mm})^2}{4}$$

$$\text{from which } D = 6.4\sqrt{\frac{\text{Coverage}}{N}} \text{ mm}$$

Knowing the number of particles, the average volume per particle can be evaluated by accurate weighing, and the Shape Factor D^3/V calculated.

Table I gives a comparison of the mean projected diameters for several diamond grits by the photo-electric and graticule methods respectively.

As can be seen, the mean projected diameters by the electrical method have a tendency to be slightly lower than those obtained by the graticule method. It is also evident that the discrepancy is more or less consistent and probably arises from some light scattering effect or may be due to the fact that some of the diamond particles are not completely opaque. A correction factor of 1.06 should, therefore, be applied in this instance, which makes the equation for the evaluation of D to read:—

Table I.

Diamond grit number	Mesh size	Mean projected diameter D(mm) (Electrical)	Mean projected diameter D(mm) (Graticule)	Correction Factor D (mm) D (Electrical)
1	100/120	0.183	0.195	1.065
2	100/120	0.225	0.238	1.060
3	85/100	0.270	0.284	1.050
4	100/120	0.243	0.256	1.050

Average Correction Factor = 1.056

$$D = 6.8\sqrt{\frac{\text{Coverage}}{N}} \text{ mm}$$

The above photo-electric method, besides being accurate and independent of personal interpretation, is very quick, and Shape Factors can be determined in a matter of a few minutes.

Acknowledgement

The authors wish to thank Industrial Distributors (1946) Ltd for permission to publish this paper.

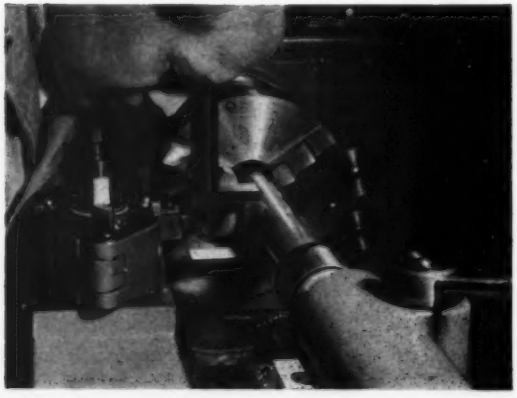
References

(1) G. Herdan. Small particle statistics, 1953, Elsevier Publishing Co, Amsterdam. Sole distributors for the British Commonwealth, Cleaver-Hume Press Ltd, 42A South Audley St, London W 1.

Setting and Profile Gauge

Continued from p. 71

is sometimes used. This apparatus consists of a vee block which is placed on the work piece. By means of the lens system an image of the tool cutting edge is formed on the test screw. This test screw has the more commonly used profiles marked thereon and the apparatus is adjusted until the profile of the cutting tool and the profile on the test screw are coincident. The apparatus can be adjusted both vertically and laterally to suit different diameters of work piece. Although the use of this apparatus permits exceedingly accurate setting of the cutting tool, it has not to date been widely used owing to certain disadvantages inherent in its design. However, a West German firm of precision engineers, now claim to have improved the design of the instrument with regard to simplicity of operation and reliability. The illustration shows the improved apparatus which possesses the advantage that it can be used on work-pieces of almost any diameter without adjustment to suit the different dimensions. The supporting vee block is placed against the work-piece as shown. This operation is independent of the diameter of the work-piece. A test screw is built in the base of the microscope draw tube. The test screw incorporates angle profiles of 30°, 50° and 55° which are so arranged as to permit the tool to be set for either internal or external threading operations. The tool is adjusted in the usual manner so that the cutting edge is the same height as the work centre. The



Concluded on p. 79

Sintered Diamond-metal Tools for Machining Glass

by

W. Cegielski*

Summary

The author has made a number of experiments in the machining of glass with sintered metal powder and diamond tools. He has used a number of different matrices and has varied the methods of manufacture and has also experimented with other abrasives besides diamond. The results of his experiments are given in tabular form. The experiments were carried out under normal workshop conditions.

Introduction

The cutters used for glass cutting are those which use an abrasive powder as the cutting element.

Formerly, diamond powder was impregnated in metal disks in the following way: a paste made from diamond dust and a binding material, such as vaseline or syrup of sugar, was pressed and rolled into the cracks of the surface of the cutter, causing the diamond particles to adhere to the disk.

Milling cutters, too, were used for glass grinding. The expressions ' milling cutter ' and ' to mill,' which are used in glass working technology, are borrowed from the terminology of metal working. This is inaccurate, for glass milling is really grinding with abrasive wheels. The milling tool for working on glass consists of a metal ring and a grinding layer containing a highly abrasive powder, most frequently diamond. The turned copper ring is indented by means of a hammer and chisel. The paste containing diamond dust is pressed into the grooves thus formed and then the grooves rolled over or peened up with a hammer. The working life of such tools is not long—a matter of a few hours. Milling tools of better quality are made by the powder-metal method.

The present work was concerned with choosing the correct matrix powders, finding their best proportions, and the parameters which would produce the tool most suited to working on optical glass. The powders were mixed, then pressed and sintered to the desired form. After the physical properties of the sintered body had been tested, the performance tests were carried out.

In the course of this work, the hardness, density, shrinkage during sintering, and also the ovality of milling tools, which appeared during the sintering, were measured. Also the structure of the sintered body was examined through a microscope.

The performance tests have been made in three industrial workshops, and in one of them cutters as well as milling tools have been tested. The quality of the cutter is shown in the cutting time taken by the diamond-metal layer on the wheel to become completely worn down. The quality of the milling tool is found in the relation between the depth of abrasion on the lens (in mm with a determined diameter of 50 mm) and the amount of wear on the milling tool. In both cases the results of the cutting or grinding are taken into consideration.

In these workshop tests the problem of blunting and self-sharpening of the tools was considered.

The following powders were used: electrolytic copper powder, crushed tin powder, reduced tungsten carbide powder, copper oxide, copper chloride, and graphite powder.

Tests of the diamond-metal sintered units used for cutting glass

Two basic mixtures were used for binding the diamond powder: the first contained ~60% tungsten carbide and ~40% copper, the second ~85% copper and ~15% tin.

The photomicrograph of the sintered body which was made from a mixture of tungsten and copper powder showed large tungsten carbide particles beside large diamond particles. The sintered product was comparatively soft. In order to obtain a sintered material with a high degree of hardness and a regular grain structure, it was decided to use a mixture of tungsten carbide and copper chloride or copper oxide. After the appropriate preparation and mixing, the mixtures were oxidized at a temperature of 950 deg C for three hours, either in their loose state or pressed into pellet moulds; they were then mechanically pulverized and reduced for 1.5 hours at a temperature of 900 deg C in hydrogen.

To be continued

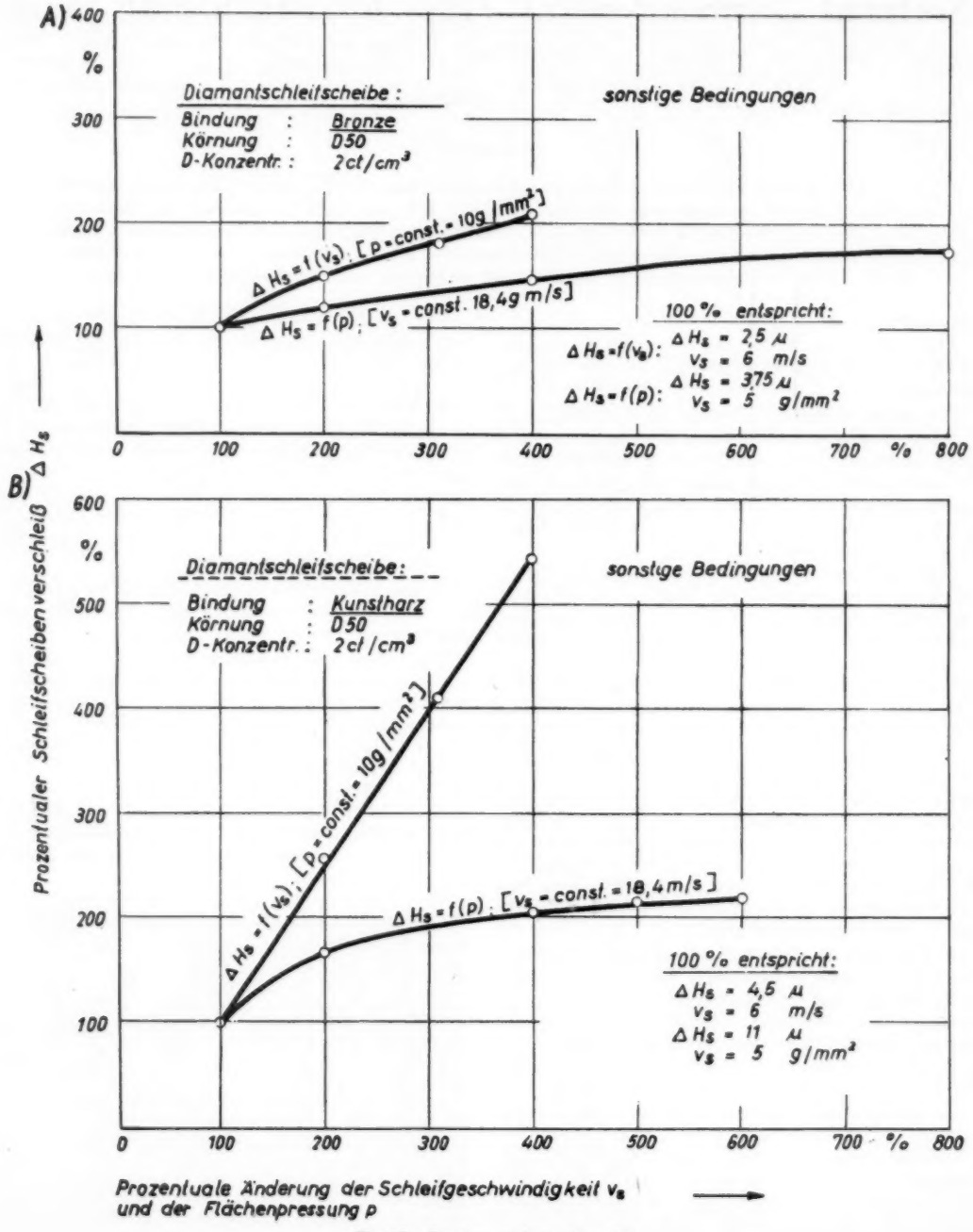


Fig 15. Caption at foot of p. 77

Grinding Sintered Carbide, Especially Sintered Carbide Cutting Tools, with Diamond Grinding Wheels

by

G. Pahlitzsch *and* **G. Rafflenbeul**

Concluded from p 59, March

6.3 *Absolute grinding wheel wear*

As Fig 15A shows, the absolute wear ΔH_s of the BZ wheel rises more with the grinding speed than with the surface pressure.

The same applies to the K wheel (Fig 15B), but here the difference is even more plainly seen.

This fact shows for the BZ wheel as much as for the K wheel, that the frequency and speed with which the individual diamond grains come in contact with the surface or edge to be ground have a much greater effect on the wearing down of the brittle, shock-sensitive diamond grain points than a higher cutting force, which is obtained with a greater force of pressure. A greater dynamic load thus has an unfavourable effect on the absolute wear. This phenomenon must be considered as a reason for the fact that the surface finish of the polished sintered carbide surface is independent of an increase in the surface pressure (compare 5.23).

6.4 *Specific grinding wheel wear*

With a BZ wheel, the specific wear S drops with an increasing grinding speed and surface pressure (Fig 16A). The differences are not, however, very great. In an overall observation of the wear and the abrasion, it is concluded that it is more advantageous to increase the grinding speed than the surface pressure. The life of a BZ wheel is indeed—from an absolute point of view—shorter, but the quantity of sintered carbide to be ground away with a particular diamond impregnation is greater. The best conditions for the BZ wheel are in high grinding speeds and high surface pressure.

The K wheel, with reference to the specific wear S, gives evidence to the contrary, with a rise in the grinding speed and surface pressure (Fig 16B). The specific wear rises steeply with the grinding speed curve $[S/_{S\min} = f(p)]$. If the curves for abrasion and wear are put together, the following rule for the most satisfactory grinding with K wheels if found; the surface pressure, or force of pressure, should approach the loadability limit of the grinding wheel, while the grinding speed should be kept low.

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2 Dawihl/Dinglinger. Handbuch der Hartmetallwerkzeuge Vol I, Springer Verlag, 1953.

3 Engdahl/Wassby. Undersoekninger oever ekonomisk verktygssliping, 1946, KTH Inst Mek Tekn Undersoekn No 77.

Concluded on p 79

Fig 15. (Left) *Percentage of grinding wheel wear in relation to the percentage change in grinding speed or surface pressure.*
Translation: *Prozentualer Schleifscheibenverschleiss = percentage of grinding wheel wear*; *Diamantschliefscheibe = diamond grinding wheel*; *Bindung: Bronze = bond: bronze*; *Koernung: D50 = Mesh size: D50*; *D-Konzentr.: 2 ct/cm³ = diamond concentration 2 ct/cub cm*; *Prozentuale Aenderung der Schleifhescgwindigkeit und der Flaechenpressung = percentage change in grinding speed and surface pressure*; *sonstige Bedingungen = other conditions*; 100% *entspricht = 100% corresponds to.*

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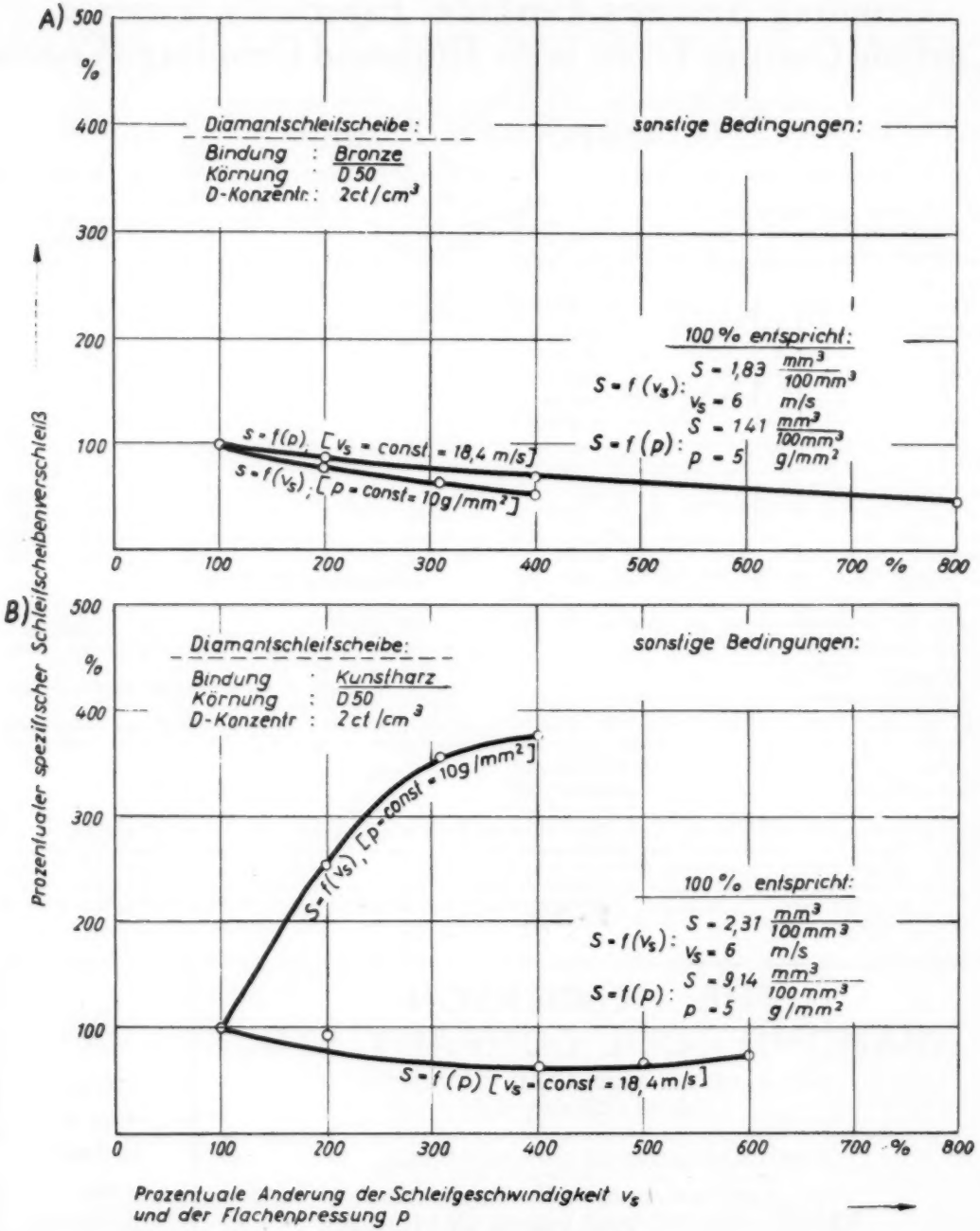
A)
%
Diamantschleifscheibe:
Bindung : Bronze
Körnung : D 50
D-Konzentr. : 2ct/cm³
sonstige Bedingungen:
100 % entspricht:
S = f(vs): S = 1,83 mm³/100mm³
vs = 6 m/s
S = f(p): S = 141 mm³/100mm³
p = 5 g/mm²
S = f(p), [vs = const = 18,4 m/s]
S = f(vs), [p = const = 10g/mm²]
B)
Diamantschleifscheibe:
Bindung : Kunstharz
Körnung : D 50
D-Konzentr : 2ct/cm³
sonstige Bedingungen:
S = f(vs), [p = const = 10g/mm²]
100 % entspricht:
S = f(vs): S = 2,31 mm³/100mm³
vs = 6 m/s
S = f(p): S = 9,14 mm³/100mm³
p = 5 g/mm²
S = f(p) [vs = const = 18,4 m/s]
Prozentualer spezifischer Schleifscheibenverschleiß
0 100 200 300 400 500 600 700 % 800
Prozentuale Änderung der Schleifgeschwindigkeit vs und der Flächenpressung p

Fig 16. Caption at top of p. 79

Fig 16. (Left) ***Percentage of specific grinding wheel wear in relation to the percentage change in grinding speed or surface pressure.*** Translation: *Prozentualer spezifischer Schleifscheibenverschleiss = percentage of specific grinding wheel wear; Diamantschleifscheibe = diamond grinding wheel; Bindung: Bronze = bond: bronze; Koernung: D50 = mesh size: D50; D-Konzentr 2 ct/cm³ = diamond concentration: 2 ct/cub cm; Bindung: Kunstharz = bond: resin; sonstige Bedingungen = other conditions;* 100% *entspricht* = 100% *corresponds to; Prozentuale Aenderung der Schleifgeschwindigkeit und der Flaechenpressung = percentage change in grinding speed and surface pressure.*

4 A. Heiss. Schartigkeit von Werkzeugschneiden. *Werkstattstechnik & Maschinenbau* 1951 Vol 41 (6) pp 233-238.

5 J. W. Ripple. Faster carbide grinding with metal-bonded diamond wheels. *Ind Diamond Rev* 1957 Vol 17 (196) pp 56-57.

Footnotes

[1] The firms of Ernst Winter & Sohn, Hamburg (diamond tools), Gebr Boehler & Co., Duesseldorf, Deutsche Edelstahlwerke, Krefeld, and F. Krupp Widia Fabrik, Essen, are thanked for their willing co-operation.

[2] Manufacturer: Peter Wolters, Kratzenfabrik & Maschinenfabrik GmbH & Co, Mettmann/Rhld.

[3] Special lapping paste by Ernst Winter & Sohn, Hamburg.

[4] Special coolant by Ernst Winter & Sohn, Hamburg.

End

Setting and Profile Gauge

Concluded from p. 74

cutting head of the tool is then adjusted to coincide with the corresponding profile on the test screw. By means of the eye-piece enlarged images of the cutting tool head and test screw can be observed concurrently. A white synthetic plate of high reflection factor serves to increase the contrast in the field of view during observations and additionally, facilitates the setting up procedure when grinding operations are performed. The latter process is relatively simple, the tool to be ground being viewed through the eye-piece and the grinding operation continued until the cutting edge and the desired profile on the test screw are seen to be coincident.

The manufacturers state that the new instrument is as simple to operate as the common screw cutting gauge but makes possible a rapid and precise setting of the cutting tool.

The manufacturers of the new gauge are Dr. Heinrich Schneider, Optotechnische Fabrik, Bad Kreuznach, Western Germany. There are British Agents.

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INDUSTRIAL DIAMOND ABSTRACTS

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1959 Volume 16
APRIL

DIAMOND MINING AND INDUSTRY

Alluvial diamond returns for October 1958

S African Mines Dept. *Diamond News* etc 1959 Vol 22 (4) pp 31-32 (Jan)

Rough and uncut diamond production in October 1958 for Cape Province : 5,298.50 ct of total value £41,693 (157s 4d per ct) ; Transvaal Province : 16,886.50 ct of total value £54,483 (64s 6d per ct). Thus total production amounted to : 22,184.00 ct of total value £96,176 (85s 0d per ct).

M *Ebe F.13.361*

Alluvial diamond returns for November and December 1958

S African Mines Dept. *Diamond News* etc 1959 Vol 22 (5) pp 30-32 (Feb)

Rough and uncut diamond production in November 1958 for Cape Province : 6,668.25 ct of total value £76,703 (230s 1d per ct) ; Transvaal Province : 10,749.75 ct of a total value £41,936 (78s 0d per ct). Thus total production amounted to : 17,418.00 ct of total value £118,639 (136s 2d per ct).

Production of rough and uncut diamond in December 1958 in Cape Province : 4,457.75 ct of total value £37,941 (170s 3d per ct) ; Private Estates : 238.00 ct of total value £2,909 (230s 5d per ct). Thus total production amounted to : 4,695.75 ct of total value £40,840 (173s 11d per ct).

M *Ebe F.13.361*

Expansion of Israeli diamond industry halted

Anon. *Gemmologist* 1959 Vol 28 (331) pp 29-30 (Feb)

Statistics for 1958 are compared with 1957 figures.

W *F.25.351*

Future of synthetic stones

Anon. *Diamond News* 1959 Vol 22 (4) pp 24-26 (Jan)

Natural diamond is still as much in demand as ever, despite the introduction of synthetics. The cheapness of developing natural sources of diamond in comparison to erecting costly plant for the production of synthetics is emphasised by the present Russian development work in the Yakutia area.

Early claimants in the synthetic field, *eg* J. B. Hannay, are discussed. *W* *Fc*Fh*

Tanganyika diamond exports

Tanganyika Dept Mines. *Diamond News* etc 1959 Vol 22 (4) p 23 (Jan)

Exports for November 1958 : 41,248 ct of total estimated value £380,680 (183s 10d per ct). Total exports for January to November 1958 : 459,616 ct of estimated value £3,933,862 (171s 2d per ct). Corresponding exports for November 1957 : 49,736 ct of total value £403,972 (162s 5d per ct). Total exports for January to November 1957 : 342,032 ct of total value £3,062,366 (118s 10d per ct).

M *F.13.364*

Direct supply of diamonds. Die Direktbelieferung mit diamanten

Anon. *Dtsch Uhrmacher Zeits* 1959 Vol 63 (2) p 66 (Feb) (In German)

New firms have been admitted for direct delivery of rough diamonds from London. They are seven gem diamond firms and two industrial firms. Four of the seven gem diamond firms are in Idar-Oberstein and three in Hanau. The sights and sales will take place between the 10th and 20th of each month in London.

A *F.251.322*

Concern about diamonds once more. Wieder einmal Unruhe um die Diamanten

Anon. *Dtsch Uhrmacher Zeits* 1959 Vol 63 (2) p 66 (Feb) (In German)

In the New York daily press articles have been describing the increasingly efficient and expanded production of synthetic diamonds by the General Electric Co. GEC plan to produce 3.5 million ct this year. However, as was pointed out in 1955 when GEC first announced their success, the largest synthetic stone produced was only 0.10 ct in weight and 1.5 mm long.

A *Fh.13.342*

Tanganyika

Anon. *Overseas Geol & Min Res* 1959 Vol 7 (3) pp 286-289

A summary report on geological and mineralogical topics. Diamond drilling carried out at Jumbadimwe Mica Mine proved the suitability of a lightweight diamond drill for exploring mica-pegmatites.

W *.12.364:Cfb Nh*

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Export of diamonds from Tanganyika

Tanganyika Dept Mines. *Diamond News* etc 1959 Vol 22 (5) p 26 (Feb)

A table shows yearly export figures from 1945 up to and including June 1958. The figures for the first 6 months of 1958 are about two-thirds of the provisional figures for 1957. Exports in this period amounted to : 245,477 ct of total value £2,195,403 (178s 9d per ct).

M *F.251.364*

Antwerp and industrial diamonds

Anon. *Diamant* 1959 Vol 2 (8) p 24 (Jan)

Figures showing Antwerp exports of industrial diamonds and boart are given for the years 1950 to 1956. Some 77% of US diamond imports in 1951 were used for machining hard metal alloys, and it is calculated that 1¼ ct of diamond is used for each kilogramme of hard metal produced in the US.

W *Fc.251.324/Fc.342*

British Guiana

Anon. *Overseas Geol & Min Res* 1959 Vol 7 (3) pp 311-313

A summary report on geological and mineralogical topics. An inquiry was made by a diamond producing company regarding the possibility of dredging for diamonds in the middle reaches of the Mazaruni River. The possibility of finding diamonds on the Pakaraima Plateau is being explored.

W *Ebc.3474:.12*

Sierra Leone

Anon. *Overseas Geol & Min Res* 1959 Vol 7 (3) pp 304-305

A summary report on geological and mineralogical topics. Prospecting on behalf of licensed diamond diggers in the diamond fields of the Kono district revealed the presence of linear features in the SE corner of the Protectorate. Some of them are undoubtedly big fault zones with which kimberlite and diamond are possibly linked.

W *Eb.3672:.12*

Mineral production in Angola. Produzione mineraria nell'Angola

Anon. *Industria Mineraria* 1959 Vol 10 Ser II (1) p 59 (Jan) (In Italian)

Diamond production in 1957 was 864,372 ct as compared with 740,055 ct in 1956, an increase of about 16%.

M *F.13.3676*

The diamond industry of Belgium

Anon. *Gemmologist* 1959 Vol 28 (331) p 30 (Feb)

Imports and exports for November, 1958, are given.

W *Bz.25.38*

News from the diggings

Anon. *Diamond News* 1959 Vol 22 (4) pp 29-30 (Jan)

A survey of activity in the South African fields.

W *Hd.361*

[' Forbidden Coast ']

Anon. *Gemmologist* 1959 Vol 28 (331) p 40 (Feb)

A report of the finding of five diamonds by divers working off the SW Africa coast.

W *Ebe.12.362*

Belgium survey for 1958

Anon. *Diamant* 1959 Vol 2 (9) pp 9-10 (Feb) (In English, Flemish, and French)

A survey of the industrial and gem diamond industry in 1958. Statistics are given.

W *F.251.31*

More diamonds in British Guiana

Anon. *Diamond News* 1959 Vol 22 (4) p 16 (Jan)

Diamonds mined in British Guiana during the first half of 1958 amounted to 14,344.75 metric ct, an increase of 290.28 metric ct over the same period in 1957.

W *F.13.2474*

Threat to Sierra Leone by diamond racket

Anon. *Diamond News* 1959 Vol 22 (4) p 15 (Jan)

A Sierra Leone Government statement on the threat of illicit operations is reported.

W *Eb.3672:.2598*

Diamond publicity in the USA

G. Gold (Baumgold Bros, Inc). *Diamant* 1959 Vol 2 (9) pp 12-13 (Feb)

W *F.222.342*

National Mineral Development Corporation

Anon. *Science & Engg* 1958 Vol 11 (4) p 123 (Dec)

The Government of India have formed the National Mineral Development Corp (Private) Ltd to exploit minerals, other than oil, natural gas, and coal, in the public sector. One of the items in the Corporation's programme is the Panna diamond mining area.

W *Bc.371/Eb.371*

Ghana's new diamond plant

Consolidated African Selection Trust Ltd. *Diamond News* 1959 Vol 22 (4) p 26 (Jan)

A new diamond extraction plant has been completed at Aninchecheche, near Akwatia, Ghana. The installation, which is described, treats gravel with an average diamond content of one part in 8,000,000.

W *Hg.367*

Minerals and non-ferrous metals in the French zone. Les minerais et les métaux non ferreux dans la zone franc

H. Lapeyre. *Industria Mineraria* 1958 Vol 9 Ser II (3) pp 149-164 (Mar) (In French)

Diamonds figure as one of the minerals produced. Since 1947, when production was little above 60,000 ct, production has increased so that in 1956 it was six times as large as in 1947. Diamonds come principally from Guinea and the Ivory Coast, from gravel deposits in which the concentration varies from 1 to 15 ct/cub m of gravel. Prospecting continues, and if the world prices remain satisfactory a new development in production may take place in the course of the next few years. 5 illustr, 11 tables.

A *F.13.3662*

Where the Vilyuy river flows [diamond area]

S. Nikitin. *Sov voin* 1958 Vol 40 (17) pp 30-31 (Sep) ; *Library of Congress Mthly Index Russ Access* 1958 Vol 11 (9) p 2843 (Dec) (Original in Russian)

X *Ebe.332*

The Australian mining industry 1908-1958

M. R. McKeown. *Chem Engg & Min Rev* 1958 Vol 51 (1) pp 51-56 (Oct 15)

A general survey of progress during fifty years. Long hole percussion drilling is finding favour over diamond drilling for certain applications.

W *Cb.38/Qbf*

Soviet diamonds

G. Zyrianov. *Chto chitat'* 1958 (8) p 13 (Aug) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3022 (Jan) (Original in Russian)

W *F.33*

The diamondiferous province in Siberia

V. S. Trofimov. *Priroda* 1957 (7) pp 10-18; abstr *Mineralog Mag* 1958 Vol 31 (242) p 648 (Sep) (Original in Russian)

This is a general and popular account of the discovery of a diamondiferous province situated between the Rivers Enisey and Lena in central Siberia. Diamonds occur in alluvial placers and in kimberlite pipes, the latter situated mainly in Western Yakutia. The majority of diamonds are of the industrial grade and below 0.1 ct in weight. *A* *Ebb.332*

Recovery of semi-heavy minerals in jigs

F. A. Williams. *Inst Min & Met Bull/Trans* 1959 Vol 68 (5) pp 161-175 (Feb)

There is need for more data on the plant-scale recovery of heavy and semi-heavy minerals through the screen in jigs in relation to specific gravity, grain size, and the number of cells in series. The author gives data in terms of the three minerals of zircon, anatase, and topaz for the specific gravity range 4.5 to 3.5 for grain sizes from 6 to 325 mesh. These results could be used to estimate the probable percentage recovery of economic and other semi-heavy minerals within this range of specific gravity, including diamond. 1 illustr, 3 tables, 7 ref. *A* *Bcz Cc*

Diamond cutting in the Jura

Anon. *Diamant* 1959 Vol 2 (8) pp 20-21 (Jan)

A survey of the history and present decline of the Jura diamond cutting industry.
W *Hl.25.3215*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND AND OTHER HARD MATERIALS

How good are man-made diamonds ?

C. A. Nisula (Simonds Abrasive Co). *Grinding & Finishing* 1959 Vol 4 (10) pp 22-26 (Feb)

Laboratory and field tests were carried out to compare the performance of synthetic and natural diamond grinding wheels used on carbides. Only resinoid and vitrified bonds were used. Results show that if light downfeeds are used, *ie* less than 0.0045 in., synthetic diamonds have the better performance; with a downfeed of 0.010 in., the synthetics outlasted natural diamonds by about 100%; at infeeds of 0.008 in., the synthetics had about 50% of the life of natural diamonds. Under the conditions of the tests, synthetics generally proved superior. 6 illustr, 2 tables.
W *Fc Nv*Fh Nv*

The Trumper gem spectroscope

L. C. Trumper. *Gemmologist* 1959 Vol 28 (331) pp 34-37 (Feb)

Notes on the operation and adjustment of the Trumper gem spectroscope. 1 illustr.
W *Vwdb Wcp*

Synthetic quartz crystals

Western Electr Co. *Design News* 1959 Vol 14 (1) p 9 (Jan 5)

The hydrothermal process, widely investigated on a laboratory scale for several years, has produced quartz crystals up to 2 to 3 in. in cross-section and 5 to 6 in. long. Economical growth rate is above 0.06 in./day.
A *Bcbz Ctc*

Cemented [sintered] boride composites for tool bits

Armour Research Foundation, Illinois Inst of Technology, Chicago 16, Ill. *ASTE Final Report* 1958 ARF Project (B687) 61 pp (June 19)

The purpose of this programme was to study boride composites for possible use as new tool materials. From a study of the wetting and solubility of a number of binder metals and borides, two systems were selected for further investigation. Alloys of nickel-titanium diboride were made by cold compaction and sintering of powders in hydrogen at temperatures up to 1560 deg Centigrade. An alloy made from powders of 20% Ni-80% TiB_2 developed a hardness of 91 RA with the hard particles having a microhardness of 2600 to 2900 VHN (50 g). These alloys contained some porosity. Alloys of iron-aluminium dodecaboride were prepared by cold compaction and hydrogen sintering, hot pressing and sintering. and by arc melting pre-sintered powder blends. The latter technique was used to achieve alloying at an elevated temperature because of the presence of a transient liquid phase in this system. The mean hardness of a 30% Fe-70% AlB_{12} arc-melted ingot was recorded as 1600 DPN (10 kg load). The microhardness of the phases in these alloys ranged from 1000 VHN (matrix) to above 4000 VHN (50 g) (hard particles). These alloys are brittle because of the presence of a transient liquid phase in this system.

The mean hardness of a 30% Fe-70% AlB_{12} arc-melted ingot was recorded as 1600 DPN (10 kg load). The microhardness of the phases in these alloys ranged from 1000 VHN (matrix) to above 4000 VHN (50 g) (hard particles). These alloys are brittle because of the matrix phase. Machining tests performed with hot-pressed blanks and SAE 1020 steel failed by nose wear and chipping. These blanks contained soft spots or lakes, which explains the results of these tests. 38 illustr, 14 tables, 15 ref. *X* *Pd Rz*

Crystallography of the diamond

C. F. Davidson (St Andrews Univ). *Econ Geol* 1958 Vol 53 (8) pp 1056-1057 (Dec)

The book *Der Diamant*, by A. E. Fersman and V. Goldschmidt, has been translated into Russian. The Russian edition has 566 pp and 49 plates; it was printed by the Academy of Sciences, Moscow, in 1955, and costs 24 roubles 40 kopeks.
W *F Ub.52*

Materials for infrared windows, domes, lenses

H. F. Hoestevey. *Electronics* 1959 Vol 32 (3) pp 56-57 (Jan 16)

Choice of transmitting materials is limited beyond three microns. Glass and quartz materials, used otherwise, are rejected in favour of such materials as arsenic trisulphide, silicon, sapphire, germanium, calcium aluminate, and strontium titanate. Sapphire is a good long wave material, transmission being reduced at 350 deg C and practically opaque at 500 deg C. 1 illustr, 1 table. *A* *We:S*

X-ray study of solid inclusions in diamonds

S. I. Futergendler. *Kristallografiia* 1958 Vol 3 (4) pp 494-496; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3022 (Jan) (Original in Russian)
W *F Gk V*

Burning out chromium in the synthetic manufacture of rubies

G. A. Mukhin & coll. *Zhur prikl khim* 1958 Vol 31 (8) pp 1160-1163; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3135 (Jan) (Original in Russian)
W *Bbeb Qc*

The wear of diamond during sawing and polishing
M. Seal. *Diamant* 1959 Vol 2 (8) pp 8-9 (Jan) (In English, Flemish, and French)

The wear action in the sawing and polishing of diamond with diamond is discussed. M. Tolkowsky's theory of microscopic fragmentation of the diamond surface is now generally accepted, and the main difference of opinion today concerns the shape and size of the displaced fragments and the reason for the directional effects. Two possible explanations of the directional effects are: (*i*) as diamonds are harder in some directions than in others, then the diamond powder abrasive will have some particles so oriented that they can cut the whole diamond, and, if the polishing is done in the softest direction, there will be many such particles and abrasion will be easy; for the hardest direction there will be no such particles and abrasion will not occur; (*ii*) a thermally induced transformation to amorphous carbon of the abraded face, caused by the friction of the abrasive, the carbon being removed by the abrasive. Evidence is given in support of this second theory, and a possible explanation is given for the observed directional variations in the friction. 1 illustr, 15 ref.
W *Fb Hlf Km/Fb Hp Km*

Effects of recent industrial-diamond developments
C. L. Fanning. *Tool Eng* 1959 Vol 42 (2) pp 177-179 (Feb)

Synthetic and natural diamonds are compared photographically. A limitation on synthetics, which are reported to perform better than natural boart in some applications, is the price which, early in 1958, was $3.48/ct compared with $2.80/ct for the natural product.

Orientation of diamonds is briefly discussed: an advantage of orientation is that mounted stones can be used up without turning or re-setting. A short description of the orientation process is given.

The new ASA Standard B67.1 on the standardization of diamond tool shanks is summarized. An interesting illustration shows how one tool shank was introduced to replace the 12 tool shanks previously produced for a tool. 2 illustr.
W *Fc*Fh/Fc Ubc:N/Psp*

DAS 1,041,850 (May 8, 1956) **A. Monath, E. Ancot, W. F. Eppler, Wiedes Carbidwerk Freyung mbH Hard material.** Hartstoff

The material is produced from a mixture of zirconium oxide and tungsten oxide heated in an H_2-stream, which leads to the incorporation of tungsten in the zirconium oxide lattice. The treatment may be carried out in the presence of water vapour, *eg* up to 50 g water per cub m hydrogen. The product is highly wear resistant and may be used where silicon carbide or boron carbide or finely divided corundum are no longer effective. (9 claims). Ref cited: *Chemiebau* 1952.
J *Rz*

DAS 1,047,180 (Apr 3, 1958) **E. Enk, J. Nickl, Wacker-Chemie GmbH**
Method for making very pure crystalline silicon carbide. Verfahren zur Herstellung von sehr reinem kristallinem Siliciumcarbid

Particularly pure silicon carbide can be obtained from gasified alkylated silanes like monomethyl-silane or alkylated halogen-silanes (trichlormethyl-silane) to which is supplied thermal energy until silicon carbide is formed. The forming temperature range lies between 600 and 1,100 deg C, and heating may be effected in a high frequency field. In order to produce a coarse crystalline carbide, heating to 1,600 to 2,000 deg C may follow in an inert atmosphere or *in vacuo*. (3 claims).
J *Bz Ct Rgc*

HARDNESS AND WEAR TESTING

The measuring industry at Mécanélec 58. L'industrie de la mesure à Mécanélec 58
G. Guillou. *Rev Gén Mécan* 1958 Vol 42 (117) pp 627-648 (Dec) (In French)

Amongst the instruments reviewed are various hardness testers: the universal testing machine (Arthuis method), made by the firm of Peter, combines all the principal types of testing. On the same stand is the Duromag for Rockwell B and C diamond tests, used for workpieces of a hardness greater than 320 Brinell. The Durocyl is an instrument designed to make Rockwell tests inside cylinders, and is a new version of the one shown in 1957 at the Laboratoires d'Armement.

At the Testwell stand Wolpert machines were shown, both special and universal designs. The Dia-testor has Zeiss magnification of ×140, ×70, and ×20, the enlarged images being projected on to a glass plate of 132 mm diameter, where they are measured by means of a movable scale. The Dia-testor measures the grain size of the workpiece by a technique recently developed by Dr Ing Rudolf Boeklen. A 90° cone diamond penetrator is used. 47 illustr.
A *Cvd Wghc.27*

Tool wear and machinability
E. M. Trent (Hard Metal Tools Ltd). *Inst Prod Engs Journ* 1959 Vol 38 (3) pp 105-130 (Mar)

An exhaustive study of sintered carbide tool wear and machinability. In carrying out the work and collating the results, a method was adopted which is of considerable value in summarizing the accumulated information on tool wear when using a variety of tool and work materials.

The first part of the article deals separately with the most important forms of wear and deterioration, *ie* (*i*) flank or clearance face wear; (*ii*) cratering wear on the top or rake face of the tool; (*iii*) build-up and associated deterioration of the rake surface and cutting edge; (*iv*) deformation of the cutting edge due to high stress and temperatures; (*v*) cracking at the cutting edge due to thermal stresses; and (*vi*) chipping of the edge or fracture due to mechanical impact. The second part of the article contains the results of various cutting tests. 36 illustr, 16 ref.
W *Pdc Unr*

Modern hardness testing. Moderne Haertepruefung
Anon. *Werkzeugen & Werkzeugmasch* 1959 (15) pp 20-22 (Feb) (In German)

Special problems of hardness measuring techniques. A review is made of all the variations on the Emcotest instrument. Rings, sheets, crankshafts, machine beds, internal hardnesses, bores, teeth edges, can all be tested on variations of this machine. 7 illustr.
A *Cvd Wghc*

Hardness testing
Anon. *Met Treatment* 1959 Vol 26 (161) pp 60-62 (Feb)

It is desirable to achieve a means of international comparison of hardness values obtained by the various test methods at present in use. This short article summarizes the most important test methods, and goes on to discuss the progress already made towards obtaining comparability between methods.
W *Cv.255*

Dial indicator equipment for checking cylinder liners for wear
British Indicators Ltd, Sutton Rd, St Albans, Herts. *Machinery* (London) 1959 Vol 94 (2414) p 379 (Feb 18)
1 illustr. *W* *Az Cw Wgm*

Investigating the wear of surfaces machined on lathes and grinding machines

N. F. Belov. *Sbor st CHPI* 1958 (9) pp 41-56 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3159 (Jan) (Original in Russian)

W *Ceq Cw*

Influence of tensions in enamel on its scratch and abrasion resistance

A. Dietzel, E. Wegner. *Mitt Ver deut Emailfachleute* 1953 Vol 1 (10) pp 43-45 ; *Am Ceram Soc Journ—Abstr* 1959 Vol 42 (2) p 37 (Feb) (Original in German)

Chemically and mechanically resistant enamels sometimes show a low surface hardness after firing. This occurs if the enamel remains under high tension, in which case scratches and cracks lead to spontaneous chipping. A lower coefficient of expansion in the cover coat increases this defect.

X *Bmk Unh Unq*

Hardness testing of large components

Edward G. Herbert Ltd, Atlas Works, Levenshulme, Manchester. *Machine Shop Mag* 1959 Vol 20 (3) p 183 (Mar)

A new Olsen Brinell hardness tester is designed for use on large components. The worktable measures 44 × 24 in., and there is a 30 in. clearance between the screws. A maximum height of 24 in. can be obtained between the table and the ball. 1 illustr.

W *Wghc*

The influence of the Rockwell C measuring process on the hardness values. Der Einfluss der Toleranzen des Messverfahrens nach Rockwell C auf die Haertewerte

K. Hild. *Zeits Instrumentenkunde* 1958 Vol 66 (10) pp 202-207 (Oct) ; (11) pp 230-234 (Nov) (In German)

Hardness values of the same testpiece vary according to the type of test made. In the experiments, aimed at discovering the variations within the Rockwell C tests, the influence of the following factors was examined : the preliminary load P_0, the additional load P_1, the cone angle α, and the radius r of the diamond indenter. Equations and technical data relating to each aspect of the subject are provided, and the results are briefly compared with results obtained by other investigators. 15 illustr, 9 tables, 10 ref.

A *Cvd Unhcd Wghc*

Testing hardness automatically

V. E. Lysaght. *Automation* 1958 pp 69-71 (Nov) ; abstr *PERA Bull* 1959 Vol 12 (2) p 44 (Feb)

Describes automated test equipment for use in production shops. *X* *Cv*

Correlation between the hardness and heat conductivity of non-metallic crystals

V. P. Zhuze, T. A. Kontorova. *Zhurn tekh fiz* 1958 Vol 28 (8) pp 1727-1733 (Aug) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3019 (Jan) (Original in Russian)

W *Bd Udb Unh*

Hardness and abrasion of enamels

F. R. Meyer. *Mitt Ver deut Emailfachleute* 1953 Vol 1 (9) pp 37-39 ; *Am Ceram Soc Journ—Abstr* 1959 Vol 42 (2) p 37 (Feb) (Original in German)

Different enamels were investigated by the Vickers hardness tester, scratch test (Dietzel), PEI method, and Taber Abraser.

See *Bibl Ind Diamond Appl* 1953 Vol 10 p B377 (Oct).

W *Bmk Cv*

Hardness of minerals and factors determining it

A. S. Povarennykh. *Zap Uz Otd Vses min ob-va* 1958 (12) pp 67-78 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3095 (Jan) (Original in Russian)

W *Bc Unh*

DAS 1,042,272 (July 10, 1952) **P. Fuchs, Erste Naxosschmirgelfabrik Deutschlands**

Material testing apparatus for granular material bonded with natural or synthetic materials. Pruefgeraet fuer mit natuerlichen oder kuenstlichen Mitteln gebundenes koerniges

The methods used for testing bonded granular materials, *eg* grinding wheels, based on the usual hardness testing methods are not sufficient, as the mechanical resistance against the penetration of a chisel has to be measured which is not equal to the depth of penetration or to the rebound in impact testers. The test, therefore, is directed towards measuring the pressure required for loosening the grain in its bond. Fig 1 shows test piece 8 under chisel 5 which is moved up and down by eccentric 2 driven through a flexible shaft 10 by motor 1. Spring 7 causes a downward pressure on bearing 6. Motor 1 also rotates eccentric 12 moving ratchet wheel 14 each time chisel 5 moves upward. Piezoelectric piece of quartz 18

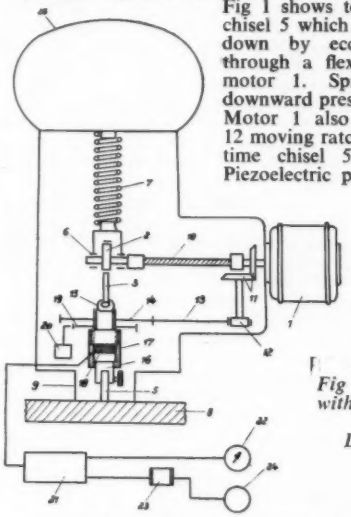


Fig 1. The apparatus with test piece 8 in position. DAS 1,042,272.

is inserted between chisel and holder, and kept under pressure by ring nut 17. The pressure differences in quartz 18 are transmitted through a two-stage amplifier 21 to voltmeter 22, and through condenser 23 to voltmeter 24. Two values are indicated, a maximum value on 22 and a mean value on 24. (11 claims, 2 illustr). Ref cited : G Pat Appl ; GP ; FP.

J *Bz Cs Cv Wgh*

TRUING OF GRINDING WHEELS

Angle dresser for tool- and cutter-grinding wheels

Steptool Corp, Los Angeles, Calif. *Machinery* (NY) Vol 65 (6) pp 171-172 (Feb)

An angle forming device for wheels used in grinding tools and cutters, and for truing cylindrical and surface grinding wheels, has recently been developed. The truing action is obtained by rocking between centres which are designed to exclude dust. The post carrying the diamond nib swivels the point in any direction. 1 illustr. *W* *Cg Nj Psf*

Russian research in fine finish grinding
Anon. *Grinding & Finishing* 1959 Vol 4 (10) pp 32-36 (Feb)

A basic feature of a new fine grinding process which reduces previous costs by 50% is fine-feed truing with either diamond, an abrasive wheel, or a sintered carbide wheel in a holder. Experiments in diamond truing showed that an improved grinding wheel surface could be produced by feeding the diamond at 0.00039 in./wheel revolution. The wheels used were ceramic-bonded electro-corundum. Details are given of the surface finishes obtained by the three truing methods, and of the actual grinding results. The importance of the wheel surface finish on the surface finish of the workpiece is stressed. 10 illustr, 2 tables.
W *Chct/Ab Cg Nj/Ab Cg Pf*

Allis-Chalmers uses new diamond dresser for honing
Allis-Chalmers Mfg Co, West Allis, Wisc. *Grinding & Finishing* 1959 Vol 4 (10) p 38 (Feb)

Cast iron transport valves having diamond bored interrupted bores of 0.495 × 2¼ in. had to be honed to +0.0002 in. with 0.0002 in. stock removal. Honing stones which were not trued before use had difficulty in holding tolerances and finish, and had to be changed regularly. The use of a True-Hone diamond truer on the hones reduced the number of changes to one set of stones each week. 3 illustr.
W *Az Chh Nqe/Az Cg*

DAS 1,045,767 E. Wildhaber, Maag-Zahnraeder u-Maschinen AG (Nov 27, 1953—conv date, USA) **Truing device for the grinding wheel of a gear grinding machine.** Abrichtvorichtung fuer die Schleifscheibe einer Zahnradschleifmaschine

The holder of the truing tool turns about an axis inclined at an angle to the plane side face of the grinding wheel. This axis has an additional inclination to a plane through the axis of the wheel and passes through the centre of the path of the truing tool. The tool holder moves in the direction of its turning movement, so that its speed ratio is higher at the beginning and at the end of its movement than in the middle. Fig 3 is a section through the wheel W' showing diamond tools 200, 201, and 202, and the difference between the actual curve 204 of the wheel flank in comparison with part of a circular path 206. Fig 2 shows the diamond tool and the holder which turn about axis 210. Annular cam 252 co-operates with feeler 220 to vary the speed in the direction of axis 210. (11 claims, 7 illustr).
J *Abmd Cg Nj Psf*

Fig 2 (right) and 3 (below). Details of the truing device. DAS 1,045,767.

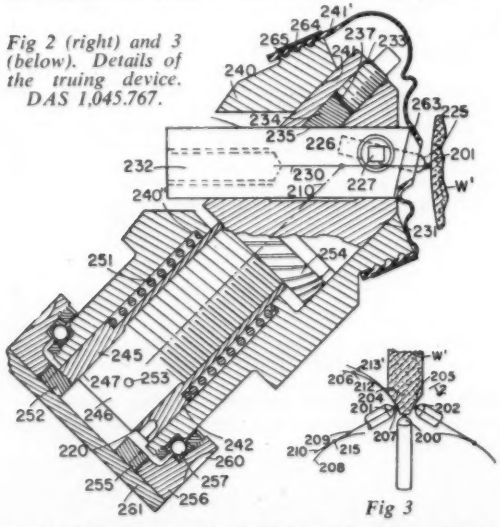


Fig 3

FINE BORING AND FINE TURNING

Electronic tracer drive reduces machining time by ¾
Anon. *Tooling & Prodn* 1959 Vol 24 (11) pp 51-52 (Feb)
5 illustr. *W* *Psz*

Automation of copy turning and turning with ceramic tools. Automazione della tornitura a copia e tornitura con utensili ceramici
Anon. *Macchine* 1959 Vol 14 (2) pp 107-112 (Feb) (In Italian)
6 illustr, 3 tables. *M* *Ceqb Pdd Prs*

Precision production boring and turning
Anon. *Machine-Tool Rev* 1959 Vol 47 (277) pp 20-24 (Jan-Feb)

A description of various applications of the British-built Heald Boramatic borers. 9 illustr.
W *Cfd Pr*

Building index automatics
Anon. *Machinery* (London) 1959 Vol 94 (2414) pp 348-359 (Feb 18)

Boring, grinding, and turning operations are described. Widia carbide tips are used for some of the cutting tools. (To be cont). *W* *Ceq Pdcb*

Taper errors caused by incorrect tool settings
M. Barash. *Machinery* (NY) Vol 65 (6) pp 111-113 (Feb)

A discussion of the numerical relationships between the inaccuracy of setting the tool and the ensuing errors in the shape. 4 illustr.
W *Ceq.21*

Modern machining methods
F. W. Boulger. *Metal Progress* 1959 Vol 75 (2) pp 138, 140, 142, 145-146 (Feb)

A digest of seven papers to the William Park Woodside Panel Conf sponsored by the Am Soc for Metals during the Nat Metal Congress, Cleveland, in October, 1958. The papers cover new cutting tool materials, constant speed machining, preset tooling, high-speed machine tools, forming methods, machining high-strength steels, and machining molybdenum.
W *Bfd Ceq/Bfq Cew/Ceq Uqfb/Pd Rz*

Fabrication of refractory metals
W. L. Bruckart. *Metal Industry* 1959 Vol 94 (7) pp 123-125, 132 (Feb 13)

(Cont). The materials dealt with are molybdenum, niobium, tantalum, rhenium, and tungsten. Advice on turning tool geometry and grinding wheel selection is given. (Concl). 2 illustr.
W *Ba Ceqb Pd Uqb*

Machining and fabrication of beryllium
K. G. Wikle. *Machinery* (London) 1959 Vol 94 (2415) pp 428-432 (Feb 25)

Recommendations cover, among other things, tool geometry and grinding conditions. Carbide turning and boring tools are advisable, and aluminium oxide grinding wheels should be used. 5 tables.
W *Bfu Ceq Pd*

High strength, high-speed tungsten carbide for high temperatures

Carmet Div, Allegheny Ludlum Steel Corp, Ferndale, Mich. *Machinery* (NY) 1959 Vol 65 (6) p 126 (Feb)

CA-604 is a new grade of tungsten carbide for the high speed finishing of steels. It has high strength at high cutting temperatures, and shows long wear life on fine boring and fine turning applications where tolerances and surface finish are important.

W *Bfd Chm Pdc*

Tool evaluation based on a merit-tool performance range

F. Cellier (Firth Sterling Inc). *Tooling & Prodn* 1959 Vol 24 (11) pp 37-41 (Feb)

5 illustr. *W* *Pd Uqe*

Production of caterpillar earth-moving equipment

Caterpillar Tractor Co Ltd. *Machine-Tool Rev* 1959 Vol 47 (277) pp 11-15 (Jan-Feb)

Various fine turning operations using Herbert lathes are described. 11 illustr. *W* *Ceqbb*

New production drilling techniques

H. Conn (Scully-Jones & Co). *Tooling & Prodn* 1959 Vol 24 (11) pp 55-56, 58, 60 (Feb)

8 illustr. *W* *Cfb*

Precimax FB.1/9 fine boring machine for cylinder blocks

Cummins Engine Co Ltd, Shotts, Lanarkshire. *Machinery* (London) 1959 Vol 94 (2414) pp 375-377 (Feb 18)

3 illustr. *W* *Cfdb Pr*

Burgmaster multiple-spindle turret drilling, tapping, and boring machines equipped with G-E tape control

F. C. Duston. *Machinery* (NY) 1959 Vol 65 (6) pp 152-154 (Feb)

The application of G-E tape control to an eight-spindle drilling, tapping, and boring machine is described. 4 illustr. *W* *Pr Wp*

What's your opinion ? . . . about brazed chipbreakers

S. H. Mittleman (Nat Supply Co). *Carbide Engg* 1959 Vol 11 (2) p 40 (Feb)

Letter to the Editor.

The availability of throwaway tool holders renders obsolete brazed chipbreakers. Early difficulties in the diamond grinding of these are recalled. Present diamond grinding wheels have made the grinding operation an easy one.

W *Al Chc Nv*

Machining and finishing holes with the aid of a rotary mandrel

E. G. Konovalov & coll. *Stanki i Instr* 1959 Vol 30 (1) pp 29-30 (In Russian)

2 illustr. *W* *Ceq Pdf*

A paradox in finish turning

V. Solaja. *Research* 1959 Vol 12 (3) pp 119-120 (Mar)

Letter to the Editor.

Tool wear affects surface finish when fine turning steel, the main cause being groove formation under the trailing edge. When turning with sharp tools, regenerative chatter can have a similar effect. The fundamental difference is that the former causes the microgeometry within one feed mark to deteriorate, whereas the latter is connected with waviness. Experiments with carbide tools are described in which both phenomena were induced. In contradiction to what might have been expected, the surface roughness decreased under these conditions. 3 illustr, 9 ref.

W *Bfd Ceqbb Pd Unr*

' Impossible ' milling now practical

C. Sharp, L. B. Main (Brown & Sharpe Mfg Co). *Machinery* (NY) Vol 65 (6) pp 100-102 (Feb)

The introduction of sintered carbide milling cutters has extended the applicability of milling. Demonstrations and tests are described. 3 illustr.

W *Cff Pdc*

Methods, tools, and machines for producing threads. I. Verfahren, Werkzeuge und Maschinen zur Herstellung von Gewinden. I

R. A. Schamschula. *Maschwelt & Elektrotechn* 1959 Vol 14 (2) pp 49-52 (Jan) (In German)

The first article of this series is devoted to external threads manufactured by means of thread wheels and presses. The subject of chip producing methods using grinding wheels and turning tools is introduced. (To be cont). 9 illustr. *A* *Cffk Pd*

Precision boring machine

AB Carl Larssons MV, Gothenburg 8, Sweden. *Machinery Lloyd* 1959 Vol 31 (5A) p 59 (Mar 7) (In English, French, and German)

Hydraulically-operated table speed is from 0 to 2,100 mm/min ; the belt driven boring spindle operates at 2,000, 2,800, and 3,500 rev/minute. The spindle bearings are lubricated automatically. Various boring heads are available, and a cutter setting device is provided. The table measures 305 × 220 mm, and maximum table travel is 210 mm. A non-automatic model is available at a lower cost. 1 illustr. *W* *Cfd Pr*

Cold point drill does fast job

Mossberg Inc. *Iron Age* 1958 Vol 182 (26) p 21 (Dec 25)

By flood cooling the carbide tip down to 100 deg F, an oil hole drill has been used to drill through a variety of hard materials, including silicon carbide.

W *Cfb Pl Qs Sj*

Machining hardened bearing races with cemented [sintered] oxide tools

H. J. Siekmann. *Machinery* (London) 1959 Vol 94 (2416) pp 481-483 (Mar 4)

From tests which are described it was concluded that sintered oxide tools can be successfully employed for machining SAE 52100 steel bearing races which have been hardened to 60-63 RC. Tool geometry and cutting conditions are given.

W *Az Bfd Ceq Pdd*

Metal cutting with ceramic tools

A. M. Vul'f. *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3092 (Jan) (Original in Russian)

Book, Gos nauchno-techn izd-vo mashinostroit lit-ry, Moscow. 1958, 182 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Bf Ceg Pdd*

Canada's first jig borer with tape control

P. Whitehouse. *Canad Machinery* 1959 Vol 70 (2) pp 89, 109 (Feb)

3 illustr. *W* *Cfd Pr Pu Wp*

CUTTING AND MACHINING OF GLASS

Polishing organic glass

T. Figel, M. Barakhman. *Prom koop* 1958 Vol 12 (9) p 6 (Sep) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)

W *Bmz Chm*

Lens polishing from diamond finish

M. H. Hawkins. *Mfg Opt* 1959 Vol 12 (5) pp 231-232 (Feb)

A new line of development is the polishing of lenses direct from diamond ground finishes. The limited work already done in this field has used 15 to 30 micron diamond powder bonded in the form of a conventional milling tool, or, in America in mushroom form. As approximately ¼ of each diamond particle is retained in the bond, the little diamond remaining for work produces a burnishing rather than a stock removal action. Maintaining form is also a problem. Autoflow have developed a precision generator with automatic cycle control which permits consistent results under varying conditions to be analysed. A medium grade of diamond was used in initial tests to establish sphericity and thickness control to an accuracy of 0.001 mm. Tests were made to establish the correct ratio between diamond tool and work spindle speeds. Having established the most suitable machining conditions, tests were carried out with specially bonded diamond tools in sizes between 15 and 60 micron until a grade was established which would give both a cutting action and smooth finish. Final test work was satisfactory and a production plant is planned. 1 illustr.

W *Bm Chc Nv Tfb*

Colloquium for experimental glass blowers

J. A. Frost. *Lab Pract* 1959 Vol 8 (3) pp 96-97 (Mar)

Reports of papers to the Ministry of Supply Colloquium for Experimental Glassblowers, London, Dec 3, 1958. M. Lawther and C. Underwood gave a Paper on 'Silica working', and G. E. Littleford gave a Paper on 'Ultrasonic machining of Glass'.

P. R. Ord discussed 'Cutting glass by diamond'. The optimum angle of the diamond faces, the 'ridge angle', has been found by experience to be 125 to 130°. Little fundamental work has been done to discover why this angle should be necessary, but it has been shown that a ridge angle of 125 to 130° allows the most satisfactory control of the cutting angle. Greater ridge angles, *eg* 140°, make the cutting angle more critical and therefore harder to maintain, while angles below 125° are extremely sensitive to lateral motion of the diamond whilst cutting. In mechanical cutting, where the diamond is more accurately controlled, the established ridge angle becomes obsolete and a certain freedom of choice is possible. Mr Ord went on to discuss a new glass cutting machine which uses a diamond with a 90° ridge angle. The machine produces a perfect cut with a complete absence of splinters.

W *Bm Ceg Nf*

Effect of deformations in grinding and polishing tools on the precision of surface configurations of machined optical parts

S. M. Kuznetsov, L. I. Shevel'kova. *Opt mekh prom* 1958 Vol 25 (6) pp 33-37 (June); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)

W *Bm Chc Tc Unf*

Diamond compound for polishing

Shandon Sci Co Ltd, 6 Cromwell Place, London SW 7. *Journ Sci Instr* 1959 Vol 36 (2) p 103 (Feb)

This diamond compound may be used for removing the Beilby layer and also the relatively thick transitional zone of deformed metal, both of which must be removed to reveal the true microstructure of the material in a given condition. It is claimed that the compound is efficient and not expensive to use. The firm also supply a dessicator capable of storing about 600 specimens with prepared surfaces.

X *Kmg*

The importance of technology for the improvement in quality of precision optical production. Die Bedeutung der Technologie fuer die Qualitaetssteigerung der feinmechanisch-optischen Produktion

P. Blume. *Feingeraetetechnik* 1959 Vol 8 (1) pp 11-16 (Jan) (In German)

One of the improvements in the optical mechanical industry of the DDR is due to the introduction of diamond tools for precision turning. This has resulted in an improvement in decorative work. All objects of light metal, which are to be finished with a shining surface, are turned with diamond. Small objects are not further polished, but, in cases where the basic material makes a surface image difficult to obtain, further polishing is necessary.

Dr Kaller has formed a theory about the surface finishing of glass and the polishing agent, in which he concludes that the following are the important factors in the glass polishing process: the surface of the glass and the layer immediately below it; the coolant, or the polishing agent contained in the coolant; the polishing agent; and the polishing base. He examines in particular: the effect of coolant on glass; the simultaneous effect of the water and the polishing pitch or felt on the glass; the role played by the polishing agent and its primary effect on glass; and the effect of the polishing agent on the pitch or felt.

A *Bm Ceqb Nf/Bm Chm Ubm*

DAS 1,044,365 (Feb 25, 1955) **A. J. C. Hall, J. G. Hayes, Commonwealth of Australia**

Method of producing graduations, patterns, and the like in glass. Verfahren zum Herstellen von Skalen, Mustern u dgl in Glas

Various methods are at present in use for making patterns in glass, *eg* by etching, physical or chemical deposition of films, cutting with a diamond, or using a special printing process. The new method is a further development of such a printing process. The pattern, made up of metal or a metal alloy, is produced on the surface of the glass, then a latent picture of the pattern formed in the glass by the first stage of heat treatment, which is then made visible by a second heat treatment. As a metal, silver is preferred, but copper is also suitable, and other metals (gold) and metal containing compositions (chlorides, sulphates). The first stage consists of heating the glass with the metal layer in an acid oxidizing atmosphere. The second treatment consists of heating the glass in a reducing atmosphere. The second stage need not always be a reducing treatment, as irradiation, *eg* with x-rays, may also produce a visible picture. The patterns are completely wear resistant as they have become integral with the glass. Inexpensive mass production is possible. (9 claims). Ref cited: 1 GP.

J *Bm Cz*

MACHINING OF STONE, ETC

Improved machine for lapping very thin slices of semiconductor material

D. Baker (Post Office Res Station). *Sci Instr* 1959 Vol 36 (3) pp 145-147 (Mar)

The equipment described laps slices down to a thickness of 0.004 inch. Wafers lapped from 0.017 in. to a final 0.010 in. show a maximum variation in thickness, over all wafers in a batch of five or more, of 0.00004 inch. Silicon carbide in kerosene is used as the abrasive. 2 illustr.

W *Bde Chd Rd*

Cutting with abrasives

R. N. Perry jun. *Plant Engg* 1958 Vol 12 (12) pp 100-102 (Dec)

Recent developments in abrasive wheels and cutting-off machines have made abrasive cutting increasingly practical and economical. The term 'abrasive cutting' covers the work performed by a thin grinding wheel, which, because of the the narrow wheel face and high unit pressure against the work, cuts through the work instead of grinding the surface. An abrasive cutting wheel cuts 12 to 20 times faster than conventional saws; it is self-sharpening because new particles of abrasive continually replace the old as they are worn down and dragged out of the matrix. In many cases, metal-bonded diamond wheels are used as being the most economical in the long run, *eg* when continuous strip concrete on highways is to be cut to confine eventual cracking to the desired location. Reinforced abrasive wheels should always be used for unstable work. The choice of material, *ie* silicon carbide, aluminium oxide, or diamond, depends on the material to be cut. Diamond wheels should always be used with a coolant, and are generally preferred for working with stone, glass, and other ceramics, owing to their better cutting qualities and longer life. 8 illustr.

A *Ceg Nvc Urc/Ceg Pef*

Experiments on the compressive strength of anhydrite

W. J. Skinner. *Engineer* 1959 Vol 207 (5377) pp 255-259 (Feb 13); (5378) pp 288-294 (Feb 20)

In order to perform the experiments, lumps of anhydrite were cut so as to produce specimens with side lengths of ¼ in. or more and of almost the required dimensions. This was done either with a carborundum or a diamond-impregnated wheel. The pieces were then ground to final size on a steel plate with a carborundum powder and water. A maximum departure from parallelism of 1 mil was reached in the grinding. Small specimens were clamped together and ground as a unit, or clamped between plates of Perspex and the plates and specimens ground down together. 14 illustr, 21 ref, 6 tables.

A *Bcz Unlb V*

Orientation control for germanium wafers

B. J. Coughlin, G. L. Davis, R. L. Kingsnorth (Mullard Valve Co). *Sci Instr* 1959 Vol 36 (3) pp 144-145 (Mar)

A description of an optical beam method for accurately mounting ingots for cutting slices, and a method for determining the orientation of small wafers. The 'mirror' for the optical beam method is obtained by notching the ingot with a diamond or a saw cut, and initiating a fracture which will reveal a surface roughly planar consisting of a number of stepped (111) faces of the required family, joined by short planes from other families. The main faces can then serve as a mirror for the optical beam method. 3 illustr.

W *Bfr Cr/Bfr Ceg*

Wire-sawing Cornish granite

John Freedman & McLeod Ltd. *Mine & Quarry Engg* 1959 Vol 25 (1) pp 16-20 (Jan)

Granite which has been cut out of the quarry and sawn by means of wire saws and a carborundum powder is polished on one side and then trimmed to the required shape by diamond-impregnated and carborundum saws. Two types of saw are available: a moving bed type fitted with a 2 ft diameter carborundum blade capable of cutting 40 in. of 2 in. slab per hour; and a 14 in. diamond-impregnated Stonekutter machine capable of cutting 400 in. of 2 in. slab per hour. 8 illustr.

A *Bnl Cej Nt/Bnl Cej Pc*

Cutting wheels

DoAll Co. *Iron Age* 1958 Vol 182 (23) p 167 (Dec 4)

Very thin diamond cutting wheels are produced to close tolerances by a new method. The wheels are for slicing and dicing germanium and silicon crystals, and can also cut high-temperature steels and alloys.

W *Nvc*

Wheels are accurate

Navan Products Inc, International Airport, Los Angeles 45, Calif. *Steel* 1959 Vol 144 (4) p 94 (Jan 26)

Diatronic diamond cut-off wheels cut fully hardened steels, silicon and germanium crystals, glass tubing, and tungsten carbide. Accuracy on the 3 × 0.006 in. wheel is +0.0005 in., −0.0 inch.

W *Nvc*

A modern factory for transistor production

Semiconductors Ltd, Cheney Manor, Swindon, Wilts. *Machinery* (London) 1959 Vol 94 (2415) pp 423-424 (Feb 25)

Details are given of germanium transistor production. The germanium crystals, produced by a pulling technique, are roughly cylindrical; the diameter is about 1 in. and the length about 8 inches. The crystals are sawn into disks by a high speed diamond wheel, and then lapped to a uniform thickness. After etching, the disks are diamond scribed and cracked into strips. A similar machine scribes the strips which are then cracked into blanks. The sorting of blanks and their incorporation in the transistor are described.

See also *Ind Diamond Abstr* 1959 Vol 16 p A10 (Jan). 1 illustr.

W *Bfr Cej Nt/Bfr Cn/Bfr Cp Nc Pr*

DAS 1,041,411 (May 30, 1952) **R. Hahn**

Cutting disk or cutting band made of metal for working stone, and method for its manufacture. Schneidscheibe oder Schneidband aus Metall fuer die Steinbearbeitung und Verfahren zu dessen Herstellung

The disk or band has recesses distributed along the whole periphery. These recesses contain diamond particles enclosed in metal displaced by a pressing operation. The usual design stipulates relatively soft metal which quickly wears off so that the particles become loose. This drawback can be eliminated by arranging the recesses radially in relation to the disk or band, with radial grooves between and parallel to the recesses, always in pairs opposite each other, which are pressed into the metal so that the displaced material is forced laterally around the recesses previously filled with diamond powder and a bonding medium. This method can be used with steel disks or bands instead of with a soft metal (aluminium), and the tools have the added advantage of cutting more freely because of the intermediate portions of reduced thickness. (2 claims, 2 illustr). Ref cited: 1 GP; 1 Swiss P; 1 USP.

J *Bn Ceg Nt*

DAS 1,045,347 (Aug 9, 1954) **A. Vates, Fa Adolf Vates**

Stone sawing cable. Steinsaegekabel

The cutters carried by the cable are splinters composed of diamond and/or carbon, with boron and silicon connected to the wire rope by a ceramic or a metallic bond. They form either a continuous series of cutters along the cable, or they may be spaced for better effect. The permanent connection between cutter and cable may be effected by a flame spraying process. (3 claims). Ref cited: 1 DBP; 1 FP.

J *Bn Cej Nqd*

ROCK DRILLING

Site investigations and colliery projects

A. Nelson. *Coll Engg* 1958 Vol 35 (417) pp 468-475 (Nov)

In order to discover which localities to avoid and which may prove suitable for mining, the mining engineer must carry out three types of investigation, the third of which consists of a drilling and testing programme based on the geophysical survey he has made, and designed to give detailed information at critical points. In general the geological evidence obtained from a few boreholes will suffice to give information about the sub-surface conditions between them. Diamond drilling is often employed to establish the rockhead and thus avoid mistaking large boulders as solid strata. The core obtained must be as undisturbed as possible. In very solid rock or very hard soil, rotary drilling with a diamond crown or similar tools may be used to obtain reliable cores. 9 illustr, 6 ref. *A* *.12:Cfb Nhe*

Names and standards for diamond core drill fittings

Anon. *Engg & Min Journ* 1958 Vol 159 (9) pp 100-101 (Sep)

New designations following the introduction of the W Series of drill rods are explained. A sectional plan through drill hole and drill rods shows the new series in relation to earlier types, and a table compares the specifications involved. A further table explains the nomenclature. 1 illustr, 2 tables.
W *Nhe.255*

Review of Convention sessions

Anon. *Min Congr Journ* 1958 Vol 44 (11) pp 58-69 (Nov)

One of the sections in the report concerns exploration and geology, and tells of V. N. Burnhart's lecture, Exploration Drilling Techniques. Mr Burnhart discussed the advances made in this field in recent years, including industrial diamonds and diamond bit design. He predicted further significant improvements in synthetic diamonds, drill hole stabilizing agents, and small diameter down-the hole drilling tools. 10 illustr.
A *.12:Cfb Nh*

Kinematics and dynamics of tricone bits

R. A. Badalov. *Izv vys ucheb zav ; neft i gaz* 1958 (8) pp 37-40 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2993 (Jan) (Original in Russian)
W *Pl Un*

Algom Nordic — development to production

M. W. Airth, E. R. Olson. *Canad Inst Min Metal Trans* 1958 Vol 61 pp 344-355 ; *Canad Min & Metall Bull* 1958 Vol 51 (559) pp 666-677 (Nov)

In opening up the Quirke property, which is part of the Algoma uranium mines, diamond drilling revealed the presence of a very large orebody. A diamond drill hole for assessment purposes proved the presence of a radioactive zone on this property, also. The arrangement of drill-holes and general working of the mines are described at length. 9 illustr.
A *.12:Cfb Nh*

Small hole bit

Claude Angwin (Pty) Ltd, Johannesburg. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3444) p 321 (Feb 13)

The Hawthorne MP small-hole bit is designed for heavy-duty service in mineral exploration, coal test drilling, foundation test drilling, and grout hole drilling. It is useful as a companion for diamond bits, and, as it uses carbide inserts, it can be used with higher pressures than can diamond bits. *W* *Cfb Pl*

Pneumatic drill for boring in shafts

Kh. Abramson. *Mast ugl* 1958 Vol 7 (9) p 17 (Sep) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2992 (Jan) (Original in Russian)
W *Pl*

Torsional moment of rock breaking in prospect hole boring

D. I. Fishelevich. *Izv DGI* 1958 Vol 28 pp 121-132 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2992 (Jan) (Original in Russian)
W *Bn Un*

Investigating rotary impact boring of holes in hard rock

V. N. Glazunov & coll. *Gor Zhurn* 1958 (10) pp 32-38 (Oct) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2993 (Jan) (Original in Russian)
W *Cfbf*

Drill removes cuttings six different ways

Houston Tool Co. *Engg & Min Journ* 1959 Vol 160 (2) p 48 (Feb)

The injector drill HD 250 removes cuttings from the hole in six ways : (*i*) vacuum ; (*ii*) reverse water ; (*iii*) forced water ; (*iv*) vacuum diamond core ; (*v*) drive coring ; and (*vi*) augering. The drill will drive at any angle in any formation. It will drill a 2¾ in. hole to 150 ft, a 3½ in. hole to 100 ft, forced water holes to 250 ft, and continuous flight auger to 100 feet. The assembly weight 1,800 lb and mounts on a four-wheeled truck or trailer. 1 illustr. *W* *Cfb Pl*

Underground exploration at Otanmaeki mine

H. E. Paarma, A. E. Levanto. *Mine & Quarry Engg* 1958 Vol 24 (12) pp 545-554 (Dec)

The geological formation of the different zones in the mine is being further explored by means of exploratory diamond core drilling, the holes varying in length between 130 and 650 feet. Extension drill steel equipment is used for long hole drilling to supplement the information thus obtained. For the diamond core drilling the mine uses three light-weight diamond core drilling machines fitted with special mounts. As samples of ores are required for chemical analysis, average ore content, etc, it is not possible to dispense entirely with the diamond core drilling method, although considerable advantages are obtained from the new extension drill steel methods with compressed air-powered rock drills. 13 illustr.
A *.12:Cfb Nhe*

Biggest diamond drill

Mindrill Ltd, Preston, Victoria, Australia. *Canad Min Journ* 1958 Vol 79 (10) p 116 (Oct)

The new diamond drill can drill vertical and angle holes to a depth of 8,000 feet. It is powered by a 18 hp diesel engine. *A* *Cfb Nh*

A large diamond drill

Mindrill Ltd, Preston, Victoria, Australia. *Chem Engg & Min Rev* 1958 Vol 51 (3) p 85 (Dec 15)

The firm is to produce a diamond drill capable of drilling to a depth of 1½ miles. It will be the largest diamond drill of its type in the world and will incorporate many advanced features.
W *Cfb Nh*

Electric drive on drills for deep core boring of prospect holes

G. P. Petrenko. *Izv DGI* 1958 Vol 28 pp 105-120 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2993 (Jan) (Original in Russian)
W *Cfb Pl Ps*

Diamond drill

Chicago Pneumatic Tool Co. *Min Engg* 1959 Vol 11 (1) p 16 (Jan)

The new CP-65 diamond drill for blast hole, coring, or grout hole work has a stepless throttle and reversible motor. The drill is mounted on a steel saddle, and is only 42½ in. long with built-in swivel head. Ball bearings are used throughout. 1 illustr.

A *Cfb Nh*

Physical properties and drillability of mine rocks

R. Shepherd. *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 2992 (Jan) (Original in Russian)

Book, Ugletekhizdat, Moscow. 1956, 45 pp, translated from the English. [Not in library of Ind Diamond Inf Bur]. *W* *Bn Un*

WIRE DRAWING

Thousand times finer than a hair

L. Grinilev. *Nauki i zhizn'* 1958 Vol 25 (9) p 69 (Sep); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3185 (Jan) (Original in Russian)

W *Sl*

Combined electro-mechanical drilling process for diamonds used in tools. Kombiniertes elektrisch-mechanisches Bohrverfahren fuer Werkzeug-diamanten

US Nat Bur Standards. *Ind Diamond Rev* 1958 Vol 18 (216) pp 214-215 (Nov); abstr *Industriekurier* 1959 Vol 12 (14) p 45 (Jan 28) (In German)

See *Ind Diamond Abstr* 1958 Vol 15 p A197 (Dec)

W *Fc Hqb Nkb*

GRINDING AND POLISHING OF HARD METALS

Jones & Shipman production-type cylindrical grinders

A. A. Jones & Shipman Ltd, Narborough Rd South, Leicester. *Machinery* (London) 1959 Vol 94 (2416) pp 495-497 (Mar 4)

The 1030-1033 range of cylindrical grinders can be supplied with Talymike automatic gauging equipment. The 1031 and 1033 will swing diameters of 7 and 10 in. respectively, and can be fitted with a hand- or foot-operated tailstock with a maximum length admitted between centres of 27 inches. The 1030 and 1032 are of similar swing capacities, and are fitted with a 'full-clearance' type tailstock taking a maximum 24 in. between centres. On the full-clearance tailstock there is provision for mounting a truing diamond at the rear of the cone centre, and the design allows the diamond to be readily presented to the wheel. Automatic control of the diamond can be supplied for truing or profile forming. *W* *Chc Pr Wp*

Turbine grinder introduced for high-speed finishing

Aro Equipment Corp, Bryan, Ohio. *Am Machinist* 1959 Vol 103 (4) p 150 (Feb 23)

The Imp 7979 turbine grinder can be used for any kind of grinding, deburring, polishing, or cutting, where ¼ in. shank mounted wheels or cutters can be used. It delivers 75,000 rev/min at 90 lb air pressure. 1 illustr.

W *Chc Prw*

Schaudt IPS internal grinding machine

Schaudt Maschinenbau GmbH. *BSA Tool Division Journal* 1958 Vol 3 (12) pp 21-24 (Oct-Dec)

Hydraulically-controlled internal grinder IPS is designed for work gripped in a chuck or collet. The wheelhead, mounted on an intermediate base, has a coarse adjustment of 4 in. at right-angles to the axis of the workpiece. The spindle is accommodated in a 3 5/32 in. bore and is driven by an endless belt from a totally enclosed motor. Rapid traverse of the wheel-head is 8 in.; it is swivel mounted and adjustable to any angle up to 90°. The truing attachment is mounted on the table and can be set to ensure alignment with the finished bore of the workpiece. The diamond can be turned to present a sharp cutting edge to the grinding wheel at all times; coarse and fine feed of the diamond are provided. The face grinding attachment employs a cup wheel which is trued while the grinding arm travels forward and backward, requiring only occasional adjustment of the diamond. 6 illustr.

W *Chcn Pr/Cg Nj*

Grinding sulfurized tool steels

L. P. Tarasov (Norton Co). *Tool Eng* 1959 Vol 42 (2) pp 77-80 (Feb)

Improved machinability of high-vanadium HSS has been obtained by adding 0.08 to 0.15% sulphur. To determine the effect of this on 'grindability', grinding tests were carried out on regular and free-machining varieties of AISI M2, M3 (type 1), and M4 molybdenum HSS, containing respectively 2, 2.4, and 4% vanadium. A D7 high-carbon high-chromium steel containing 4% vanadium was also evaluated. Ease of grinding was assessed from surface grinding tests, supplemented by a form grinding test on the M4 steel. Tests with aluminium oxide wheels, diamond trued, are described, and it is concluded that the addition of sulphur improves the grindability of high-vanadium tool steels in the hardened condition. The improvement is greater for dry grinding than for wet. 1 illustr, 3 tables.

W *Bfd Unge Utb*

Improved cutter fixing on bore bit grinding machines

Anon. *Shakht stroi* 1958 (9) p 30; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)

W *Al Chc Pr*

Pressure-sensitive tape holds small parts for grinding

Anon. *Grinding & Finishing* 1959 Vol 4 (10) p 39 (Feb)

The use of double-sided pressure sensitive tape for holding thin brass parts during a grinding operation increased production by 300%. A slight loss in parallelism resulted, but the technique has been extended for use with carbide tools. 1 illustr.

W *Cr Pz*

Grinding wheel standards still neglected

Anon. *Metalworking Prodn* 1959 Vol 103 (10) p 425 (Mar 6)

Some disappointment has been voiced recently over the seeming reluctance of many metalworking firms and grinding machine makers to adopt standardized sizes of grinding wheels, as provided for in the BS 620 : 1954. The article comments on some potential advantages of standardization. *W* *Pe.255*

Ex-Cell-O Numeri-Trol tape-controlled machine which has interchangeable heads for profile milling and grinding

Ex-Cell-O Corp, Detroit, Mich. *Machinery* (London) 1959 Vol 94 (2417) pp 567-568 (Mar 11)

2 illustr. *W* *Cff Pr/Chc Pr*

Grinding milling cutters. Schleifen von Fraeswerkzeugen
Anon. *Technik & Betrieb* 1959 Vol 11 (2) yellow insert pages (Feb) (In German)

(Cont). The correct clearance face width can be found with the help of a diagram provided. The infeed in relation to the clearance angle and the helical angle is also discussed, and the geometry of the angle of inclination is described. 2 illustr.
A *Al Chc*

Woodward universal attachment
Anon. *Machine-Tool Rev* 1959 Vol 47 (277) p 10 (Jan-Feb)

The Woodward table and auxiliary equipment for tool and cutter grinders permit the grinding of cutting angles and clearances on cutting tools, forming convex and concave radii on grinding wheels, grinding radii on side and face cutters, and grinding reamers and end mills. The diamond truing attachment and other features are briefly described. 2 illustr.
W *Al Chc Pr Ps*

The importance of coolant filtration
Anon. *Machinery* (London) 1959 Vol 94 (2414) pp 347, 401 (Feb 18)
W *Sk:Qeb*

Belt grinding
Addison Tool Co Ltd, Addison House, 28 Marshalsea Rd, London SE 1. *Metal Industry* 1959 Vol 94 (7) p 131 (Feb 13)

The Diamant 225 abrasive belt grinder uses 7 ft 4 in. of 3 in. abrasive belt. The 2.5 hp motor produces 2,800 rev/minute. Rubber contact disks of 10 in. diameter are used. *W* *Chc Nvg*

Abrasive wheels cut 'chips'
H. V. Allison (Am Chain & Cable Co Inc). *Grinding & Finishing* 1959 Vol 4 (10) p 37 (Feb)

A description of the photographic apparatus used in examining the cutting action of grinding wheels. Possible future developments in grinding arising from information thus obtained are suggested. 1 illustr.
W *Chc Pe Uqz.131*

New products and processes
Degussa. British Rep: F. S. Bayley, Clanahan & Co. *Times Rev of Ind* 1959 Vol 13 (146) p 32 (Mar)

New grinding wheels are available which consist of a sintered polycrystalline ruby material in a solid, almost fused mass. They are claimed to be superior to bonded wheels as they retain their profile much longer. The wheels are produced in four finishes and a variety of shapes. *W* *Pe Rjeb*

New grinding technique boosts single-point tool life
De Vlieg Machine Co. *Iron Age* 1959 Vol 183 (2) pp 66-68 (Jan 8)

A new precision grinder for single-point tools grinds points with either cylindrical relief or cone-type relief. 4 illustr. *W* *Al Chc Pr*

Grinding quill
Dumore Co, 1300 Seventeenth St, Racine, Wis. *Tool Eng* 1959 Vol 42 (2) p 151 (Feb)

The Dumore 12x-350 grinding quill is available for use with the Dumore 12 precision grinder. It can also be used for special workheads mounted in the grinder, or by itself held in a special fixture. It is completely sealed against grit and moisture, and is particularly suitable for grinding with diamond wheels on ceramics, quartz, and other highly abrasive materials. 1 illustr.
W *Chc Pr Ps*

Automation problems of grinding processes. Problemi di automatizzazione dei processi di rettifica
B. T. Breev. *Macchine* 1959 Vol 14 (2) pp 113-120 (Feb) (In Italian)

9 illustr. *M* *Chc.133*

Burdett surface grinder
G. W. S. Burdett & Co Ltd, Eastgate, Peterborough. *Metalworking Prodn* 1959 Vol 103 (8) p 341 (Feb 20)

The grinder is available in three models, with working surfaces up to 18 × 6 inches. It is provided with a downfeed hand wheel with micrometer control, and a micrometer crossfeed for side grinding. The spindle, driven by a 1 hp motor, accommodates a 7 × ½ in. grinding wheel. Optional extras include built-in truers and diamonds. 1 illustr. *W* *Chcm Pr*

Tool grinders
Ex-Cell-O Corp, Detroit, Mich. *Canad Machinery* 1959 Vol 70 (2) p 142 (Feb)

Two new tool grinders are equipped for conventional grinding at one end and chipbreaker at the other. Style 142 is for conventional grinding with vitrified or diamond wheels, and style 264 is equipped with metal-bonded diamond wheels for electrolytic grinding. 1 illustr. *W* *Al Chc Pr*

Using the dipping method in grinding objects with composite profiles
O. M. Gel'fel'd, A. I. Rivkin. *Stanki i Instr* 1958 Vol 29 (9) pp 19-21; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)
W *Chc*

Sharpening damaged button dies
H. J. Gerber. *Grinding & Finishing* 1959 Vol 4 (10) p 40 (Feb)

A method of grinding button-type thread dies along the whole length of the inside tooth faces, using a flat-faced dish grinding wheel. 1 illustr.
W *Az Chc Pe*

One set-up hardens and grinds slideways
T. S. Harrison and Sons Ltd. *Metalworking Prodn* 1959 Vol 103 (10) pp 406-408 (Mar 6)

Delapena induction hardening equipment has been adapted for use on a modified Snow surface grinder in such a way that once the lathe bed has been set up on the grinder table, rough grinding, hardening form wheel truing, and finish grinding operations can be completed without further handling. 4 illustr.
W *Chcm Pr/Cz Pr*

Automation and abrasives. L'automazione e gli abrasivi
D. Griffini. *Macchine* 1959 Vol 14 (2) pp 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189 (Feb) (In Italian)
M *Rd*

Instrument for sharpening circular saws with sintered carbide inserts. Appareil pour l'affutage des scies circulaires à pastilles de carbure
Ets P. Hug & Mongin, 35, Rue de Lyon, Paris 12e. *Rev Gén Mécan* 1958 Vol 42 (117) p 659 (Dec) (In French)

The machine consists of a support for holding the saw and a wheel-holder, on which is a 180 mm Crystolon wheel. One of the accessories which can be attached to the machine is a diamond wheel. The machine will take, on the largest model, a saw diameter between 175 and 1500 mm, with a bore of 18 to 50 mm. Two other models have a maximum capacity of 600 mm each, the one standing on its own and the other to be mounted on a wall bracket. 1 illustr.
A *Al Bkc Chc Nv*

Effects of materials on snagging wheel performance

J. R. Gregor (Peninsular Grinding Wheel Sales Corp). *Grinding & Finishing* 1959 Vol 4 (10) pp 28-31 (Feb)

Beginning with the success of cryolite as an active filler for resinoid wheels, later developments in snagging wheels are traced, primarily as recorded in patent literature. It is concluded that the key to better performance is properly selected combinations of fillers. 2 illustr, 15 ref. *W* *Pe S*

Cylindrical grinding machine

A. A. Jones & Shipman Ltd, Narborough Rd Sth, Leicester. *Machine Shop Mag* 1959 Vol 20 (3) pp 186, 187 (Mar)

Work capacity of the grinder is 3 in. diameter × 12 in. long. Roundness, when grinding on dead centres, is below 0.000010 in., and, when using a live standard workhead centre, is 0.000025 inch. Surface finishes down to 1 micro-in. CLA are produced. The design of the grinder is relatively simple. 1 illustr.
W *Chc Pr*

Experimental study of polishing wtih a grinding abrasive

S. M. Kedrov. *Stanki i Instr* 1958 Vol 29 (6) pp 22-24 (In Russian)

12 illustr. *W* *Chm Rd*

Experience in high output grinding ; cylindrical grinding in a tool section

G. D. Kochetkov. *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)

Book, Gos nauchno-tekhn izd-vo mashinostroit litry, Moscow. 1958, 36 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Al Chc*

Experience with high-speed grinding at the ChTZ

S. N. Korchak. *Stanki i Instr* 1959 Vol 30 (1) pp 31-34 (In Russian)

2 illustr, 1 table. *W* *Chc Uqfc*

Grinding a really tough material

Raytheon Mfg Co, Waltham 54, Mass. *Am Machinist* 1959 Vol 103 (4) p 118 (Feb 23)

A missile radome, believed to be of a ceramic material similar to that used for ceramic tools, is ground on a modified 30 × 30 × 72 in. horizontal spindle surface grinder with tracer control. A segmented diamond grinding wheel is used. A precision ground radome, hand lapped on critical areas and radii, serves as the master which is followed by a continuous Kopy-Kat hydraulic tracer. The outside surface of the radome is ground in relation to the internal diameter, maintaining critical dimensions on wall thickness. Grinding removes up to 0.400 in. of material in cuts that remove up to 0.070 in. in a single pass, yet there has been no dulling of the diamond wheel. A highly detergent coolant is used. When the wheel gets loaded, it is cleaned by being turned slowly against a soaked vitrified wheel. 1 illustr. *W* *Az Bl Chcm Nv Pr*

Unit lops 24 hours off job

Wallingford Steel Co, Wallingford, Conn. *Steel* 1959 Vol 144 (5) p 88 (Feb 2)

Grinding and finishing of solid carbide rolls was formerly carried out with 600, 1500, and 2000 mesh wheels, followed by four lapping passes at 6 hr/pass. Following the installation of a Gisholt 52-A Superfinisher, with a high-speed oscillating head, only the 600 mesh wheel is required for grinding prior to finishing, and all four lapping operations have been eliminated. 1 illustr.
W *Ag Bkc Chn Pr*

Grinds special point

Oliver Instr Co, 1442 E Maumee St, Adrian, Mich. *Steel* 1958 Vol 143 (24) pp 162, 164 (Dec 15)

The Model 21 drill pointer is the latest addition to the Oliver range. Standard equipment includes ¼ hp motor, grinding wheel, diamond truer, jaw assemblies, and setting gauge. 1 illustr.
W *Alb Chc Pr*

Automatic feed mechanism for the centreless grinding of taps

V. A. Povidailo, R. I. Silin. *Stanki i Instr* 1958 (11) pp 23-24 ; *Engs Digest* 1959 Vol 20 (2) pp 81-82 (Feb) (Original in Russian)

3 illustr. *X* *Psb*

Taper and contour grinding on Springfield machines

Springfield Machine Tool Co, Springfield, Ohio. *Machinery* (London) 1959 Vol 94 (2417) pp 569-572 (Mar 11)

Several machines and applications are described. The 3 TR grinder can be used for contour grinding and all normal grinding operations. The machines are used for diamond grinding work on missile components.
W *Chc Nv Pr*

Tungsten-carbide powders for hard-surfacing and abrasives

Shwayder Chemical Metallurgy Corp, 684 E Woodbridge, Detroit 26, Mich. *Machinery* (NY) Vol 65 (6) pp 124-125 (Feb)

'Mikrocarbide' sintered tungsten carbide powders are suitable for hard surfacing, abrasives, diamond settings, and other uses where a hard, wear resistant material is required. They are suitable also for use as secondary abrasives in metal-bonded diamond wheels and truers.
W *Bkcb Rd*

Automatic sizing for grinding machines

Taylor, Taylor & Hobson Ltd, Stoughton St, Leicester. *Machine Shop Mag* 1959 Vol 20 (3) pp 187-188 (Mar)

A description of the Talymike size control equipment for cylindrical grinders. 1 illustr.
W *Chc Pr Wp*

Thompson hand-feed surface grinder

Thompson Grinder Co, Springfield, Ohio. *Machinery* (NY) 1959 Vol 65 (6) pp 158-159 (Feb)

The type D hand-feed surface grinder has a vertical capacity of 14 in. under a 7 in. wheel. Anti-friction ball nuts and screws are incorporated in the crossfeed to eliminate the possibility of the wheel creeping away from the work when shoulder grinding.
W *Chcm Pr*

Wright surface grinding machines

Wright Electric Motors (Halifax) Ltd. *Machinery* (London) 1959 Vol 94 (2416) p 507 (Mar 4)

The 58/V6 cross-swing, column-mounted surface grinder has a T-slotted worktable measuring 14¼ × 10 in., with a maximum distance of 10 in. between grinding wheel and table. The self-contained motorized grinding head is available in five sizes up to 4 hp, and is very adaptable. *W* *Chcm Pr*

Zwicky-Amiet twist drill grinder

G. Zwicky (London) Ltd, 193 Victoria St, London SW 1. *Machinery* (London) 1959 Vol 94 (2416) pp 504-506 (Mar 4)

Twist drills with right- and left-hand flutes, from 0.012 to ¼ in. diameter, can be ground to a high degree of accuracy. The operating procedure is outlined.
W *Alb Chc Pr*

Specima and Jung grinding machine demonstration

Vaughan Assocs Ltd, 4 Queen St, London W 1. *Machinery* (London) 1959 Vol 94 (2416) pp 515-517 (Mar 4)

Various Specima cylindrical and Jung surface grinders are described. 4 illustr.

W *Chc Pr/Chcm Pr*

Automatic control of the precision of dimensions during grinding

S. S. Volosov. *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)

Book, Gos nauchno-tekhn izd-vo mashinostroit lit-ry, Moscow. 1958, 117 pp. [Not in library of Ind Diamond Inf Bur]. *W* *Chc Pr Wp*

Die grinders provide vibration-free operation

Thomas C. Wilson Inc, 21-11 44th Ave, Long Island City, NY. *Carbide Engg* 1959 Vol 11 (2) p 28 (Feb)

A portable high-speed die grinder features a powerful three-bladed air motor and air-cooled precision bearings. Filing, grinding, cutting, and polishing operations can be carried out, and the two sizes of tool available have rated speeds of 40,000 and 60,000 rev/minute. 1 illustr. *W* *Az Chc Pr*

DAS 1,040,409 **A. R. Bergamo, Dalmine SpA**
(Jan 29, 1953—conv date, Italy)

Device for producing profiled faces on cutting tools by grinding with a loose abrasive. Vorrichtung zum Schleifen von Profilflaechen an Werkzeugstaehlen mit losem Schleifmittel

A hollow body rotating about a horizontal axis whose interior cylindrical face is provided with annular or helical grooves of a profile corresponding to a counter-profile of the profile to be produced, holds loose abrasive suspended in a liquid in its bottom portion. The tools to be ground are fixed side by side in a holder projecting from the open end into the body, so that the faces of the tools to be profiled can be applied to the grooved interior and subjected to the action of the abrasive carried around inside the body. (1 claim, 2 illustr). Ref cited : GP 355,008 ; *Werkstattbuch* 1951 (105). *J* *Al Chch Pz Rd*

DAS 1,040,411 (Jan 26, 1956) **K. Lau, Ernst Winter & Sohn**

Diamond grinding or lapping disk with a peripheral grinding layer. Diamantschleif- oder -laeppscheibe mit am Umfang vorgesehenem Schleifbelag

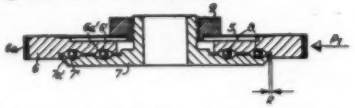


Fig 4. Peripheral grinding or lapping disk. DAS 1,040,411.

The grinding portion 6 with its grinding layer 6a, Fig 4, is supported on balls 8 on hub portion 7, and further subject to the pressure of resilient membrane 5 adjustable by nut 9. On pressure in the direction of force P_1 exerted *eg* when a tool is ground, a slight shift of the grinding portion 6 will result in bending of the membrane. Balls 8 will then move up in their shallow grooves but return to their positions in the central lines of the grooves under the resilient pressure of the membrane when force P_1 decreases. (1 claim, 1 illustr). Ref cited : 1 GP ; 1 FP ; 1 USP.

J *Nv*

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

DAS 1,040,929 (Feb 4, 1957) **W. Caspers, K. E. Baldauf, Peter Wolters oHG**

Method of improving the efficiency of single or double disk lapping or grinding machines. Verfahren zur Verbesserung des Arbeitsergebnisses bei Ein- oder Zweischeiben- Laepp- oder Schleifmachinen

It has been found that the uneven wear of the lapping and grinding disk is dependent on the speed of the workpieces along their curved paths and on the form of the curves described on the disks. In a double disk machine, the lower disk usually acquires a conical or a funnel shape, and the upper disk a corresponding shape. The disks have therefore, to be trued from time to time in order to permit further precision work. This can be avoided by varying periodically or continuously the ratio between the speeds of the workpieces and of the lapping or grinding disks either manually or automatically. (1 claim).

J *Chc Pe Unr Uqfc*

DAS 1,041,832 (July 22, 1955) **H. Lindstedt, Standard Elektrik Lorenz AG**

Pneumatic grinding head on devices for grinding plane parallel or spherically curved surfaces. Pneumatischer Schleifkopf bei Vorichtungen zum Schleifen plan-paralleler oder sphaerisch gewoelbter Flaechen

The grinding of optical lenses or piezoelectric elements of, *eg* quartz, requires a combination of a rotary movement with an oscillating movement in order to obtain as many points of contact as possible between workpiece and grinding disk or dish. Uniform pressure is difficult to achieve. The problem is solved by arranging the workpiece in a recess of a holder to which compressed air is supplied, pressing the workpiece against the grinding face with adjustable pressure. (3 claims, 2 illustr). Ref cited : 2 GP.

J *Chc Ugh*

DAS 1,041,853 (July 13, 1957) **O. Helmboldt, G. Holder, P. Vogt, Gebr Giulini GmbH**

Method of making a grinding and polishing material. Verfahren zur Herstellung eines Schleif- und Poliermittels

Grinding and polishing can be effected in one operation with a material obtained by adding not more than 5% vanadium trioxide to hydrated aluminium oxide, aluminium hydroxide, or gamma-aluminium oxide, heated in the presence of a mineralizer to a temperature not above 1300 deg Centigrade. A brittle and splintering alpha-aluminium oxide is produced with vanadium-trioxide in the lattice. (1 claim). Ref cited : 2 GP. *J* *Ct Rd*

DAS 1,042,415 (Mar 8, 1954) **Fritz Wendt KG**

Device for working surfaces. Vorrichtung zur Bearbeitung von Oberflaechen

Fine grinding is carried out with a non-rotating grinding tool subjected to two oscillating motions simultaneously in non-parallel directions. One of the motions is carried out at more than 1,000 oscillations/min, and both motions are effected by the same motor, which produces the slower motion (vertical reciprocation) directly, while the fast oscillation (horizontal reciprocation) is produced by an intermediate block excited by an eccentric. The block is guided by parallel leaf springs and carries the grinding tool. (5 claims, 4 illustr). Ref cited : 2 DBP ; 1 GP.

J *Pe Pz*

DAS 1,042,451 **C. A. Redfarn**
(July 19, 1954—conv date, Gt Britain)

Grinding bodies and method for their manufacture. Schleifkoerper und Verfahren zu deren Herstellung

The usual resin-bonded grinding wheels have a bond of a phenol-formaldehyde resin which is easily

destroyed by frictional heat, leading to the loss of abrasive grains (diamond, boron carbide, aluminium oxide, etc) and which generally has reduced resistance at higher temperatures. It has been found that polymerizable phosphonitryl chlorides are an especially useful bonding means for abrasive grains. The bond may be used in a varied form together with polyhydric aromatic compounds. (9 claims).
J *Cs Sh*

DAS 1,043,859 (April 20, 1953) **K. Geppert, Kugelfischer Georg Schaefer & Co**

Device for compacting crumbling abrasive and forming it by compression into grinding wheels. Vorrichtung zum Verdichten und Verpressen von kruemeligen Schleifmasse zu Schleifscheiben

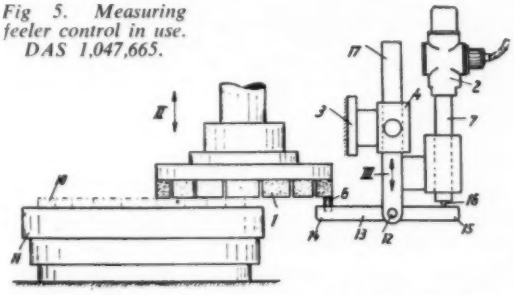
The mould is provided with an axially movable bottom plate. The open top is superposed by a removable rotary roller head carrying several freely rotating conical rollers. These rollers are supported on the outer rim of the mould and a central shaft passing the mould. The hydraulically or mechanically movable bottom plate serves as plunger, while the rotating rollers thoroughly knead the material. (3 claims, 3 illustr). Ref cited : 4 GP.
J *Pz*

DAS 1,047,665 (Mar 10, 1956) **H. Maedrich, Diskus Werke Frankfurt a/M AG**

Measuring feeler control for surface grinders. Messtastersteuerung fuer Planschleifmaschinen

DAS 1,042,417 describes a measuring feeler arrangement fixed to the machine outside the range of the tool or carriage. A stop is connected to the carriage

Fig 5. Measuring feeler control in use. DAS 1,047,665.



adjusted so as to contact the feeler at each reciprocation of the carriage, lifting the feeler and causing a certain tool feed. Towards the end of the operation the stop is shifted and does not produce a further feed. The constant lifting of the measuring feeler causes feeler wear, which is eliminated by the new arrangement. The stop 6 is fixed, as shown in Fig 5, to lever 13, which co-operates with feeler 16 to arrest the feed. Stop 10 is made of wear resistant material. (4 claims, 3 illustr). Ref cited : 1 DBP ; 1 GP ; 3 USP. (Add DAS 1,042,417).
J *Chcm Pr W p*

NEW MACHINING METHODS

The application of spark erosion machining

A. J. Lawrence. *IPE Journ* 1958 pp 694-709 (Nov) ; *PERA Bull* 1959 Vol 12 (1) p 14 (Jan)

The advantages and limitations, limits of accuracy and rates of operation from three years' experience.
X *Ceqn*

Impact grinder, ultrasonic type

Raytheon Mfg Co, Waltham 54, Mass. *Electronics* 1959 Vol 32 (1) p 68 (Jan 2)

Model 2-335 ultrasonic impact grinder uses a magnetostrictive transducer for cutting, slicing, drilling, grinding, and trepanning regular or irregular shapes quickly. The materials which can be worked include semiconductors, ceramics, ferrites, carbides, metals, and jewels. 1 illustr.
A *Chcz Pr*

Electrolytic grinding at Timken Roller Bearing

E. W. Pennington. *Tooling & Prodn* 1959 Vol 24 (11) pp 43-44 (Feb)

Economies in the cost of grinding carbide cutting tools in the automatic screw machine departments of The Timken Roller Bearing Co, Canton, Ohio, have been effected by introducing electrolytic grinding for certain purposes. An Anocut 300 amp unit is combined with a Porter-McLeod cut-off machine and a Norton surface grinder. The surface grinder is used for chipbreaker grinding. A complete chipbreaker is ground at one pass of the diamond grinding wheel, usually to a depth of 0.018 to 0.020 in., and to a width of from 0.045 to 0.080 inch. The metal-bonded diamond grinding wheel is 3/16 in. wide by 8 in. diameter. Diamond of 150 mesh is used in 100 concentration. An adapter makes it possible for both sides of the wheel to be used before truing. 3 illustr.
W *Al Bkc Chcr Nv*

When is grinding not grinding ?

W. E. Hoffman. *Tooling & Prodn* 1959 Vol 24 (11) p 42 (Feb)

Electrolytic grinding replaces the former method of carbide grinding in which silicon carbide grinding was followed by diamond grinding. The whole job can be done electrolytically, eliminating the silicon carbide wheel and producing a finer finish. Diamond wheel life in electrolytic grinding is several times that of similar wheels used in conventional grinding. In one operation, the cost of conventional methods was $6.63/cu in. of carbide removed ; this cost was reduced to $1.60/cu in. of carbide removed when grinding electrolytically with a diamond wheel. 2 illustr.
W *Bkc Chcr Nv*

Facing valve tappets with tungsten carbide

Mack Trucks Inc, Plainfield, NJ. *Machinery* (London) 1959 Vol 94 (2417) pp 555-557 (Mar 11)

In one operation, a Hammond oscillating electrolytic grinder, using a diamond wheel, is employed. 4 illustr.
W *Chcr Nv*

Vertical electrolytic grinder steps up carbide grinding

Mattison Machine Works. *Tooling & Prodn* 1959 Vol 24 (11) p 48 (Feb)

A new vertical spindle electrolytic grinder is designed for use on brazed carbide tools. Loading and unloading efficiency is improved by the magnetic table wedges which are energized individually just before the workpieces go under the diamond wheel, and de-energized after the pieces leave the wheel. Surface finishes up to 6 micro-in. can be obtained while removing up to 0.012 in. of tungsten carbide in a single pass. The 100 mesh 100 concentration diamond wheel is 16 in. in diameter, has a 4 in. face, and 1/16 in. depth of diamond. 1 illustr.
W *Al Bk Chcr Nv*

Drill jewel bearings thermally

Carl Zeiss, Oberkochen. *Product Engg* 1959 Vol 30 (7) p 23 (Feb 16)

Bearing jewels are now drilled by means of electron beams in from 3 to 6 seconds.
W *Bb Cfbm Tc*

Electrically aided grinding

L. A. Williams (Anocut Engineering Co). *Grinding & Finishing* 1958 Vol 4 (8) pp 4, 6 (Dec)

Letter to the Editor.

Comment on article 'A study of electrically aided grinding' [see *Ind Diamond Abstr* 1958 Vol 15 p A199 (Dec)]. The points raised are (*i*) the voltage used depends on several variables; (*ii*) a current of 250 or 270 amps is excessive and undesirable; (*iii*) the original coolant tank supplied had a 25 gall capacity: (*iv*) deplating of the diamond wheel is not recommended and should not be necessary; (*v*) a limit of 1/32 in. is better than $\frac{1}{8}$ in. over-run when the wheel oscillates beyond the work; (*vi*) the use of indicating screws for the purpose of truing a wheel is not recommended; (*vii*) a normal linear removal rate of 0.070 to 0.090 in./min on grade 350 carbide can be expected, not 0.040 in./min; and (*viii*) test work should include the measurement of spindle power.

W *Chcr*

[Electrically aided grinding]

S. Youman (AIT Diamond Tool Co). *Grinding & Finishing* 1959 Vol 4 (10) pp 4-5 (Feb)

Letter to the Editor.

In reply to 'Electrically aided grinding' (*above*), the following comments are made: (*i*) the original article [see *Ind Diamond Abstr* 1958 Vol 15 p A199 (Dec)] covered a test grinding one grade and size of carbide, with one voltage setting, one infeed pressure, and with new coolant for each wheel; (*ii*) the performance of the diamond wheel only was under test; (*iii*) $7\frac{1}{2}$ v was found to be the ideal voltage; (*iv*) the best AIT wheel showed a meter reading of 250 to 270 amps, removing carbide faster than, and with finishes equal or superior to, those obtained with lower amperage wheels; (*v*) a $2\frac{1}{2}$ gall tank was used for the test, but the 25 gall tank is superior for production use; (*vi*) deplating is suitable under certain conditions; and (*vii*) an over-run of 1/32 in. is preferable to an over-run of $\frac{1}{8}$ inch.

W *Chcr*

Electrolytic grinding wheel

Anocut Engg Co, Chicago, Ill. *Grinding & Finishing* 1959 Vol 4 (10) p 59 (Feb)

A 26 in. diameter metal-bonded non-diamond wheel has been constructed for use in electrolytically machining the edges of super-alloy jet engine blades. The abrasive section is $\frac{1}{4}$ in. deep. 1 illustr.

W *Ceqh Pe Urc*

7 new ideas for honeycomb

Anocut Engg Co, Chicago, Ill. *Am Machinist* 1959 Vol 103 (4) pp 100-101 (Feb 23)

Faster machining of honeycomb is made possible by a metal wheel having a serrated periphery. It is set up similarly to an electrolytic wheel, and interrupts the current flow 2,500 times/second. Metal removal rate is reported to be 1,200 to 3,000% of that obtained with standard electrolytic grinding. 4 illustr.

W *Az Cegh Pd*

Electromachining speeds its attack . . .

H. L. Kee. *Product Engg* 1959 Vol 30 (9) pp 59-60 (Mar 2)

Japax electrical discharge machines operate with a cutting speed better by a factor of 2 than other similar equipment. The improvement factor on roughing cuts jumps to 40. Close control over spark discharge widens the range of surface finishes available. Details are given of special features on the Japax equipment. 3 illustr.

W *Ceqm Pr*

Progress of electrolytic polishing

Yu. V. Baimakov, K. P. Batashev. *Khim nauka i prom* 1958 Vol 3 (4) pp 464-470; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3034 (Jan) (Original in Russian)

W *Chmk*

What electromachining can offer . . .

Anon. *Product Engg* 1959 Vol 30 (9) pp 60-62 (Mar 2)

A survey of some of the advantages of the electrolytic process—using a diamond wheel, the electrical discharge process, and the ultrasonic process. 1 table.

W *Ceqm/Ceqr Chcr Nv*

POWDER TECHNOLOGY

Test sieves

British Standards Inst, 2 Park Street, London W 1. *BS* 410 : 1943, 30 pp. Price : 6s

This latest revision of BS 410 : 1943 incorporates all subsequent amendments, and particular attention has been paid to the tolerances on aperature dimension of fine mesh series sieves. Consequently, modified tolerances on average and maximum apertures have been adopted which are more evenly graded throughout the series. An additional tolerance—the intermediate tolerance—has been introduced; this lies approximately between the average and maximum tolerances. A further control has been introduced by specifying tolerances on wire diameter. More stringent tolerances have been adopted for special test sieves required in research and control work. Provision is made for smaller test sieves to meet the requirements of wet sieving.

W *Pq.255*

TOOL PRODUCTION

Automatic machine for incising grooves on tubular diamond cutters

A. B. Zemtsov. *Opt mekh prom* 1958 Vol 25 (6) pp 42-45 (June); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3022 (Jan) (Original in Russian)

W *F Hl Nf*

DAS 1,042,449 (Apr 22, 1955) **Wiedes Carbidwerk Freyung mbH**

Method for producing bodies of a high melting metal and of a high melting metal oxide, and the use of the bodies as abrasives. Verfahren zur Herstellung von Koerpern aus einem hochschmelzenden Metall und einem hochschmelzenden Metalloxid und die Verwendung der Koerper als Schleifmittel

Sintered products of high melting oxides and metals have the disadvantage of relatively easy deformation and little resistance to oxidation. These disadvantages are avoided and certain advantages obtained by the following method. A finely granulated mixture of a high melting metal oxide (zirconium oxide; aluminium oxide; an oxide or hydroxide of a high melting metal such as tungsten) is heated, preferably in a reducing atmosphere (hydrogen), to a temperature above the melting point of the high melting metal oxide, which results in reducing the oxide or hydroxide of the metal.

No liquid melt is produced. A crystallization, however, occurs during which the high melting metal oxide is built into the crystal lattice of the metal and the metal into the crystal lattice of the oxide. The bodies obtained are electrically conductive, resistant to oxidation temperatures above 2,000 deg C, resistant to acids, dense, tough, and hard. Apart from the zirconium oxide and aluminium oxide mentioned above, thorium oxide, hafnium oxide, magnesium oxide, vanadium oxide, or mixtures of such oxides with high melting metals like tungsten and molybdenum may be selected, and less high melting metals, *eg* cobalt, may be added for cementation. (6 claims). Ref cited : DBP 834,363 ; Skaupy *Metallkeramik* 1950.
J *Cql*

DAS 1,048,530 (Oct 2, 1957) **W. Bauer, E. Singer, Siemens-Schuckertwerke AG**

Method for making bodies of sintered hard materials. Verfahren zur Herstellung von Koerpern aus Sinterhartstoffen

The basic material is aluminium oxide which is mixed with zirconium nitride, shaped, and sintered. The composition may contain equal parts of aluminium oxide and zirconium nitride. Titanium nitride may be added. (3 claims). *J* *Bbc Cql*

SURFACE FINISH TESTING

Standard for the choice of surface roughness instruments. Norme orientative sulla scelta di un apparecchio per la misurazione della rugosità superficiale

G. Feinabend. *Macchine* 1959 Vol 14 (2) pp 121-126 (Feb) (In Italian)

7 illustr. *M* *Cx Wgf.255*

Changes in profilometers used in measuring minor surface roughness

A. N. Kartasheva. *Standartizatsiia* 1958 Vol 22 (4) pp 43-46 (July-Aug) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3159 (Jan) (Original in Russian)
W *Wgfb*

Statistical analysis of the roughness of profiles subjected to grinding

Yu. V. Linnik, A. P. Khusu. *Lonito-Mash* 1958 Vol 47 pp 144-146 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)
W *Chc Unf.213*

Miniature crystal pick-up measures surface roughness

NV Philips Gloeilampenfabrieken, Eindhoven, Holland. *Design News* 1959 Vol 14 (2) p 15 (Jan 19)

A very small piezoelectric pick-up with a sapphire needle is used to test surface finish. The pick-up, when drawn over the test object, produces a voltage proportional to the average roughness. The voltage is boosted in a 2-tube amplifier, then rectified and fed to a moving-coil instrument. Internal finishes of bores down to 5/16 in. can be measured. 1 illustr.
A *Cw Wgf*

Surface waviness caused by surface grinding

M. M. Palei. *Stanki i Instr* 1958 Vol 29 (9) pp 21-22 (Sep) ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (10) p 3055 (Jan) (Original in Russian)
W *Chcm Unf*

Effect of cooling media on tool stability and surface finish

V. M. Zaitsev. *Stanki i Instr* 1958 Vol 29 (6) pp 12-14 (In Russian)

3 illustr, 1 table. *W* *Pd Qs Sj*

Visual surface measurement

Carl Zeiss. *Metal Industry* 1959 Vol 94 (8) p 152 (Feb 20)

A light section microscope for examining surface finish is being installed at the Blackburn works of Mullard Limited. The illumination and observation microscopes are set at right-angles to each other and at an angle of 45° to the testpiece. A ' profile ' observation is thus obtained which can be photographed by the camera attachment. A reticule with vertical and horizontal crosslines can be adjusted to measure roughness depths. Special cradles are provided for holding cylindrical specimens. 1 illustr.
W *Vs Wcm*

DAS 1,046,345 (Feb 28, 1958) **H. Hediger**

Apparatus for measuring surface roughness. Geraet zur Messung der Oberflaechen-rauhigkeit

The apparatus is of the kind in which a stylus point produces electric pulses while moving to and fro across the surface to be tested at a constant speed. In order to eliminate all electrical or mechanical influences in the transmission to the crystal, a hydraulic transmission is inserted between drive and stylus point consisting of a liquid filled tube with resilient containers at both ends. The electrical connection between stylus and amplifier passes the liquid filled interior of the tube. (3 claims, 3 illustr). *J* *Cx Wgf*

MISCELLANEOUS

Machine construction and electrical equipment in the Leipzig Spring Fair, 1959. Maschinenbau und Elektrotechnik auf der Leipziger Fruehjahrsmesse 1959

Anon. *Maschwelt & Elektrotechn* 1959 Vol 14 (2) pp 52-63 (Jan) (In German)

Amongst the tools and instruments discussed is a profile projector called the ' Microtecnica ' Type MT/2. The original purpose of the simple projector was that of enlarging the object from 5 to 100 times so that the profile could be compared with the ideal profile to which it should conform, and it is now widely used in the fields of testing, measuring, examining, copying, and finishing. In finishing processes, the projector is useful for work on profile workpieces, threads, etc, worked with, *eg* diamond files, and it has the advantage that measurements can be made easily and simultaneously on all parts by several technicians at once, and that the surface of the workpiece is not touched.
A *Qd Wcg*

Automatic manufacture of bearings—Timken Roller Bearings' Bucyrus Plant

Timken Roller Bearing Co. *Metallurgia* 1959 Vol 59 (351) pp 13-16 (Jan)

6 illustr. *W* *Psn Qc*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd, 226 Latymer Court, London W.6. 54s 6d, post free.

'Harmonic precision' — a new concept in ultramicrotomy

B. Hellstroem. *Science Tools* 1958 Vol 5 (3) pp 33-37 (Dec)

The performance of a slide bearing used in an ultramicrotome has been studied. Although the clearance of the rotor in the stator is of the order of 0.01 mm, it is possible to use the bearing in routine work and with good reproducibility for the cutting of sections with a thinness which is 10^3 times smaller. This is due to the fact that the motion of the rotor is ideally harmonic. By properly orienting the specimen holder on the circumference of the rotor, it can be arranged that the knife contacts the specimen when the erratic motion of the latter is a minimum, which occurs four times during each revolution of the rotor. The working principle of a test instrument, the Microproximeter, designed for the measurement of extremely small distance variations, is described. The sensitivity of the Microproximeter is very high, a distance variation of 100 AU resulting in a displacement of an oscilloscope track by about 1 cm, *ie* a magnification of 10^6. 3 illustr.

X *Pdm Ps*

New machines at Elgar exhibition

Elgar Machine Tool Co, 172-178 Victoria Road, Acton, London W 3. *Metalworking Prodn* 1959 Vol 103 (5) pp 204-206 (Jan 30)

Among the machines shown at a recent exhibition were a variety of Continental boring, milling, grinding, and turning tools. 7 illustr.

W *Ceqb Pr/Cfd Pr/Cff Pr/Chc Pr*

Ultrasonics aid fountain pen production

Parker Pen Co. *Metalworking Prodn* 1959 Vol 103 (5) p 188 (Jan 30)

Operations on fountain pen components require press tool and diamond engraving operations, both of which are susceptible to damage by dirt. Ultrasonic cleaning has reduced the risk of damage.

W *Qeb Qnf*

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

PUBLICATIONS RECEIVED

BOOK REVIEW

Annual of grinding and polishing technique and surface treatment 1959. Jahrbuch der Schleif- und Poliertechnik und der Oberflaechenbehandlung 1959

Vulkan-Verlag Dr W. Classen, Essen. 1959, 512 pp, illustr, tables. Price : DM14.-- (In German)

The book contains well-arranged information and a certain number of advertisements, inserted so as not to interrupt the text too frequently, concerning many aspects of grinding, polishing, and surface treatment. Wigo Wiegand has written a poem which precedes the main part of the book by way of a non-technical introduction. The subjects treated are grouped under the headings of grinding materials, methods and applications, and machines and tools; in this latter section various machines manufactured at present are named and described. Finally there is a miscellaneous section which gives hints on uses of tools and a variety of general information. One of these articles is on the use of diamond dust, giving the appropriate applications, quantities, and grain-sizes. Lists of trade-names, manufacturers, and products are included, as well as addresses from which products can be obtained.

A *Chc/Chm/Km*

TRADE LITERATURE

Time saving tools for machine shops and grinding departments

Reliance Tool & Mfg Co, 1919 Clybourn Ave, Chicago 14, Ill. 1 p, illustr, 8½ × 11 in.

The EZ Set diamond holder retains the diamond by means of an aluminium pressure cap with a hole through which the diamond protrudes. The pressure of the cap causes the concealed portion of the diamond to cut itself a firm bed which grips the diamond. Reliance angle truers, height truers, and radius truers are available complete with diamond, and the price of the height truer covers a face truer mounted on the same frame.

W *Nj*

Jones-Shipman production grinding machines, heavy duty automatic with toolroom accuracy

A. A. Jones & Shipman Ltd, Narborough Rd South, Leicester. 8 pp, 8½ × 11 in., illustr

Production grinder models 1030 to 1033 are designed for cylindrical grinding with toolroom finishes and accurate size repetition. A spark-out timing device is incorporated so that loaded machines can run through their cycle automatically. Electro-hydraulically operated controls permit advantage to be taken of gauge sizing methods. The machines can be adjusted to 'tarry' for up to 5 seconds at either or both ends of the stroke. For normal straight grinding purposes, the truing diamond is carried in the tailstock of the machine. Optional controls can be fitted which warn the operator when a wheel requires truing. The button-operated truers can be made to pass the wheel from 1 to 4 times, taking a truing cut from 0 to 0.002 inch. After truing, the machine runs back automatically to the working position to await the next workpiece.

W *Ab Cg Nj Psf/Chc Pr*

Ceramics—unlimited horizons

Aluminium Company of America, 1501 Alcoa Building, Pittsburgh 19, Pa. 15 pp, 8½ × 11 in., illustr

The history of ceramics is briefly described—they were used 12,000 years ago—and modern uses of ceramics are illustrated. Aluminium oxide is the most common ceramic form in the precision engineering industry, both as a grinding wheel abrasive and in the form of inserts for cutting tools.

W *Bl.28/Pddb/Pe Rj*

Gem quality diamond dies . . .

British Diamond Wire Die Co Ltd, Parkstone, Dorset. 12 pp, 6 × 9 in., illustr

This is a well-illustrated catalogue which confines itself to a general description of the manufacture and maintenance of diamond wire drawing dies. Profile and mounting nomenclature is explained, and the drilling of a diamond is shown in diagrams and photographs. Two pages of useful information on diamond die maintenance include notes on various aspects of die wear and the appropriate treatment.

W *Hq/Nkb.138*

Collected catalogues [Nichols equipment]
W. H. Nichols Company, Waltham 54, Mass.

The Nichols range of milling machines is supported by a comprehensive range of attachments which add to their versatility. Catalogues describing the range of machines and attachments can be obtained from the manufacturers. Models 6-SA and 8-SA have been adapted for slicing silicon and germanium boules. Norton diamond wheels are used for both dicing and slicing: slicing wheels are from 3 × 0.010 in. to 8 × 0.025 in., and dicing wheels from 2 × 0.004 in. to 6 × 0.015 inch. For use on silicon, 180 mesh diamond is recommended, and 220 mesh is used for germanium. Depth of diamond section is from 1/16 to ¼ in., depending on the size of wheel, and a cutting speed of 5,000 to 6,000 surface ft/min is recommended.

W *Cff Pr.57*

CORRIGENDA

See *Ind Diamond Abstr* 1959 Vol 16 p A17 (Jan)
Metals : *for* 0.4 mm *read* 0.010 mm

See *Ind Diamond Abstr* 1959 Vol 16 p A25 (Feb)
Portable hardness tester : *for* (Dec) *read* (Jan)

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3650) (Jan 28)

810,865 BISTERFELD, E. (trading as BISTERFELD & STOLTING). Cutting tools or cutting elements for tools.

811,041 MORRIS (ABRASIVE CUTTERS) LTD, F. A. Grinding wheel dressers.

811,000 TAYLOR (HOLDINGS) LTD, J. & H. Grinding machines.

The Official Journal (Patents) 1959 (3652) (Feb 11)

811,473 REISHAUER-WERKZEUGE AG. Dressing of abrasive hobs.

The Official Journal (Patents) 1959 (3653) (Feb 18)

812,056 INDUSTRIAL DISTRIBUTORS (1946) LTD. Treatment of diamonds.

812,012 SPARCATRON LTD. Electric disintegration of conductive materials.

812,092 NORTON GRINDING WHEEL CO LTD. Process for the production of borides.

The Official Journal (Patents) 1959 (3654) (Feb 25)

812,427 EBAUCHES SA. Grinding process and a grinding machine for providing a rounded edge on the periphery of a plate or disk.

812,231 FLEXIBOX LTD. Lapping machines.

812,461 BISTERFELD, E. (trading as BISTERFELD & STOLTING). Fusion abrading process for removing surface material from flat and curved metal workpieces, and apparatus for carrying out said process.

UNITED STATES

Official Gazette 1959 Vol 738 (1-4) (Jan)

2,867,060 L. COES jun, NORTON CO. Centreless grinder.

2,867,063 L. H. METZGER, SUPER-CUT INC. Multiple grinding wheel.

2,867,137 W. R. JOY. Cutting tools and method of making same.

2,867,140 S. A. GETTS, METAL CUTTING TOOLS INC. Core drill.

2,867,149 C. T. GODDARD, BELL TELEPHONE LABORATORIES INC. Method of determining surface flatness.

2,867,413 O. K. OLSEN. Well drilling bits.

2,867,694 C. PEARSON. Disk record cutting means.

2,868,947 E. M. WILLIAMS, C. P. PORTERFIELD, FIRTH STERLING INC. Spark machining apparatus.

2,869,288 O. BRETCHER, GESELLSCHAFT DER LUDW VON ROLL'SCHEN EISENWERKE AG. Slideway grinding machine.

2,869,292 I. L. KLUGMAN. Precision grinding machine.

2,869,294 S. A. BOETTCHER, J. C. PAGE, ABRADING SYSTEMS CO. Lapping machine.

2,869,295 W. R. NAUMANN, DAIMLER-BENZ AG. Method of forming grooves on a shaft.

2,869,405 D. M. WOLFE, AMERICAN IRON & MACHINE WORKS CO INC. Trepanning head.

2,869,534 A. STIHL. Grinding chain tool.

2,870,523 H. J. RICHARD, T. J. LA LIME. Cutting tools.

2,870,578 O. BAIER, NSU WERKE AG, F. WANKEL. Mechanism for machining trochoidal rotors and counter-rotors.

2,870,580 C. G. NORTON, PACIFIC VALVES INC. Flat lapping machine.

2,870,582 A. RASKE. Inflated grinding wheel.

2,870,761 F. E. BUEZKOWSKI. Radius and ellipse dresser for grinding wheels.

2,870,836 N. P. ROSATO, S. E. SIEMEN, UNITED STATES OF AMERICA. Trepanned core cut-off tool.

2,871,177 G. E. COMSTOC III, NORTON CO. Electrolytic grinding apparatus.

SWISS

Patentliste 1958 (23) (Dec)

334,721 A. PETER, GEBR PETER. Hole finishing machine for watch jewels.

334,722 A. PETER, GEBR PETER. Finishing machine for watch jewels.

334,723 A. PETER, GEBR PETER. Hole finishing machine for watch jewels.

334,734 N. MIRONOFF, ATELIERS DES CHARMILLES SA. Device for controlling the position of an electrode of a machine for working by electro-erosion.

334,739 H. E. BALSIGER, LANDIS TOOL CO. Machine for grinding a workpiece.

334,744 P. HAWTIN, DENTAL MANUFACTURING CO LTD. Method for making a grinding tool, and grinding tool made by the method.

FRENCH

Bulletin Officiel 1958 Vol 75 (3895) (Dec); 1959 Vol 76 (3896-3900) (Jan)

1,176,310 F. CATTIN, AG FRITZ STUDER. Device for feeding machine tool carriages without play and at uniform pressure in their end positions.

1,176,347 F. E. BIRTCH, B. H. JOHNSON, MIDUGAN TOOL CO. Method and apparatus for grinding endless screws.

1,176,596 J. A. HJALSTEN, SANDVIKENS JERNVERKS AB. Drill head for percussion drilling.

1,176,740 SANDVIKENS JERNVERKS AB. Sintered hard metal alloy.

1,177,000 NV PHILIPS' GLOEILAMPENFABRIEKEN. Apparatus for counting particles.

1,177,829 J. R. ERICKSON, CIE DES MEULES NORTON. Cut-off wheel.

1,177,894 G. McKINLEY CALVERT, CALVERT HONING TOOL CO. Device for dimensioning a grinding tool.

1,177,899 J. SUNNEN. Honing tools.

1,178,430 A. M. A. A. NOURRISSON. Drilling tool for hard and brittle materials.

1,178,471 E. M. WILLIAMS, C. P. PORTERFIELD, FIRTH STERLING INC. Device for machining by electro-erosion.

1,178,553 CIE DES MEULES NORTON. Method of obtaining objects having an abrasive or rough surface, and objects thus obtained.

1,178,722 BIRMINGHAM SMALL ARMS CO LTD. Method and machine for spark machining.

1,179,097 NV PHILIPS' GLOEILAMPENFABRIEKEN. Method of manufacturing semiconductor systems.

1,179,403 C. P. PORTERFIELD, FIRTH STERLING INC. Device for machining an electrically conductive workpiece by electro-erosion.

1,179,526 R. SMITH GORMAN, ROLLS-ROYCE LTD. Methods of barrel polishing, and abrasives used for these methods.

GERMAN

Patentblatt 1959 Vol 79 (3-6) (Jan-Feb)

Specifications Open to Public Inspection

1,048,846 F. STIMAMIGLIO. Deep drilling apparatus.

1,048,848 HELLEFORS BRUKS AB. Percussion drill with hard metal cutting bit having only one cutting edge traversing the face of the drill head.

1,048,886 W. WITTENBORG WELBON, GENERAL ELECTRIC CO. Method for removing foreign metals from technical tungsten carbide.

1,048,894 G. L. HERVERT, H. S. BLOCH, UNIVERSAL OIL PRODUCTS CO. Method of making aluminium oxide.

1,049,107 K. RUTHARDT. Sintered hard metal alloys.

1,049,189 J. F. BARRY, N. C. SEELEY, WESTERN ELECTRIC CO INC. Application of an electrolytic method for producing a cut in a semiconductor without tension.

1,049,262 F. ERDELYI, ROHDE & DOERRENBERG. Centreless circular grinder.

1,049,264 A. MOHRENSTEIN. Balancing device, in particular for grinding machines having a resonator.

1,049,266 W. OSENBERG. Tubular face grinding body.

1,049,267 W. OSENBERG. Peripheral grinding wheel.

1,049,268 W. OSENBERG. Face grinding wheel.

1,049,290 L. J. FROST, NATIONAL LEAD CO. Abrasive of great hardness, and method for its manufacture.

1,049,661 F. B. PHILIPS, L. HARVEY, DISTILLERS CO LTD. Tool for the chip producing machining of metals.

1,049,730 R. HABIB. Automatic grinding machine.

1,049,731 C. W. GEHRING. Honing tool with manually operated honing stone adjustment.

1,049,808 T. O. RAMNERT, SVENSKA DIAMANTBERGBORRNINGS AB. Rock drilling machine.

1,049,987 H. SALOW, W. VON MUENCH, TELEFUNKEN GmbH. Semiconductor device for detecting electromagnetic and corpuscular radiation.

1,050,152 J. LOOMAN, ZAHNRADFABRIK FRIEDRICHSHAFEN AG. Device for truing profiled grinding wheels for grinding helical gear wheels.

1,050,153 O. BAUKNECHT, ZAHNRADFABRIK FRIEDRICHSHAFEN AG. Device for truing the profiled working face of grinding wheels for grinding spurwheels with straight and helical teeth.

1,050,222 K. H. SCHULTZE, H. LINDNER GmbH. Feeding device for gear grinding machines.

1,050,223 T. MICHAELIS, VEB FREIBERGER PRAEZISIONSMECHANIK. Tool for the chip producing shaping of a stepped body consisting of circular ribs, in particular of a Fresnel lens, and method for its manufacture.

1,050,224 E. ROTZOLL, HERMINGHAUSEN-WERKE GmbH. Device for compensating the wear on grinding wheels of centreless grinders.

1,050,225 W. OSENBERG. Face grinding wheel.

1,050,226 H. W. WOERNER, J. DICHTL. Grinding wheel assembled of individual grinding laminae.

1,050,264 H. SCHWARZKOPF, J. G. VAN OTTERLOO, CONSOLIDATED DIAMOND TOOL CORP. Cutting wheel for cutting abradable bodies.

1,050,683 R. ENGEL, E. BECKER, TELEFUNKEN GmbH. Device for supplying dosable quantities of a mixture of a liquid and a fine granular solid substance.

Patents Granted

971,514 FRITZ WENDT KG. Method of working surfaces, in particular of fine grinding.

971,479 F. DORFNER, J. DORFNER. Method and tool for grinding to accurate dimensions holes, complex interior and adjacent exterior rim surfaces of grinding wheels.

971,588 K. C. NICHOLSON, CARBORUNDUM CO. Refractory body of zirconium boride and method for its manufacture.

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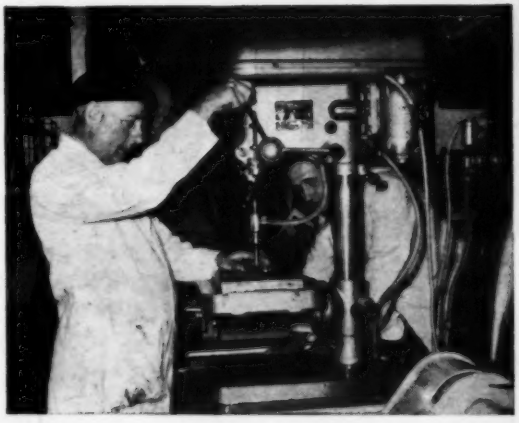

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